Compliments of
Edgar T. Ensign

BIENNIAL REPORT

OF THE

FOREST COMMISSIONER

OF THE

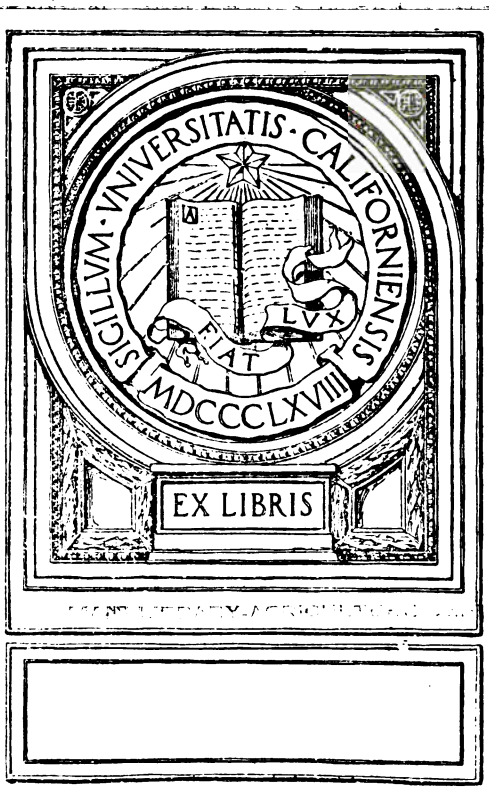
State of Colorado,

FOR THE

YEARS 1887 AND 1888.

(SECOND EDITION)

DENVER, COLO.:
THE COLLIER & CLEAVELAND LITH. CO., STATE PRINTERS.
1889.


SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
FIAT LVX
MDCCCLXVIII
EX LIBRIS

BIENNIAL REPORT

OF THE

FOREST COMMISSIONER

OF THE

STATE OF COLORADO,

FOR THE

YEARS 1887 AND 1888.

(SECOND EDITION)

DENVER, COLO.:
THE COLLIER & CLEAVELAND LITH. CO., STATE PRINTERS.
1888.

STATE OF COLORADO,
Office of the FOREST COMMISSIONER,
DENVER, December 15, 1888.

To His Excellency,

ALVA ADAMS,

Governor of the State of Colorado:

SIR:—I have the honor to submit a statement of the action of the Forest Commissioner for the years 1887 and 1888, together with such information and suggestions as may be useful in preserving the forests of the State, and maintaining the supply of water.

Inasmuch as my annual report for 1887 was not printed, I have deemed it expedient to embody in this a statement covering the two years.

I remain, sir,

Very respectfully yours,

EDGAR T. ENSIGN,

Forest Commissioner of the State of Colorado.

TABLE OF CONTENTS.

VI. BIENNIAL REPORT OF FOREST COMMISSIONER.

REPORT.

The Significance of Forests.

A wise Providence, anticipating the wants of man, clothed large portions of the earth with forests. They beautified the rugged forms of nature and softened the asperities of climate; their sheltering arms afforded refuge, and their varied products ministered to the necessities of all creatures. Within their depths arose sparkling streams—sources of comfort and joy to all.

The prodigality of nature in this regard, and the beauty and utility of her many forms of forest life, have not been justly appreciated, and the rich heritage has been ruthlessly wasted and destroyed.

At this day nearly all inhabited portions of the globe are suffering from the wasteful use or wanton destruction of forests, and people and governments are becoming aroused to the need of arresting the evil. Most European nations have already adopted earnest measures of reform.

Let us consider briefly the climatic influence of forests. The subject is easy of comprehension; it is governed by a few plain, natural laws. A large forest, like a large sheet of water, affects the surrounding atmosphere, causing currents of air, condensation of vapor, etc. The difference between the temperature of a forest and an adjoining plain is apparent to the most casual observer. The forest is comparatively cool in summer and warm in winter. It is estimated that the average temperature of interior forest air is about ten per cent. lower than that of the open country; the absence of

fierce winds and powerful sunlight accounts, in a great degree, for its equability. It thus appears that a forest holds within its limits a large body of air, the temperature of which varies to a minimum degree only throughout the year. Over such stratum of air gather clouds, the frequent precursors of vapor, rain or snow. "The relative humidity of forest air has been found to be from three to ten per cent., and in pine forests in summer as high as thirteen per cent. greater than in the open. Observations in France place the difference at one to three per cent. in favor of deciduous, and seven to thirteen per cent. in favor of pine forest, the greater difference occurring in the summer months. Evaporation in the field is greater by fifty-seven per cent. in spring, sixty-four per cent. in summer and winter, and sixty-six per cent in the autumn."

Upon the area and density of a forest depends very largely the measure of its influence upon the surrounding atmosphere. It is known, however, that even belts and groves of trees perform a useful office in checking the violence of atmospheric changes. Who can doubt that if our prairies and plains were interspersed with these natural barriers, the frequency and destructiveness of tornadoes, hail-storms, and other like phenomena, would be sensibly diminished?

The mechanical influences of forests are seen in many ways. They protect mountain and other sloping surfaces from erosion; they shade the ground, preventing the early and rapid melting of snows and undue evaporation of moisture; the humus, or leaf covering, of forest areas acts as a sponge, absorbing the waters and securing their gradual descent to lower elevations; the roots of forest trees, penetrating the ground, promote the formation of springs. Forests guard the sources of all important streams and furnish their water supply; they

regulate the flow and volume of water, and greatly obviate the danger of floods and droughts.

The industrial significance of forests is too large a subject to be adequately treated in this connection. All classes and conditions of men are more or less dependent upon forest products; society would be revolutionized if deprived of them. Forest supplies enter into the composition of our buildings, furniture, household and mechanical implements, fencing, roads, bridges, and transportation by land and sea. Fire-wood, charcoal and numberless food, medicinal and chemical products are derived from the forests. Many great and useful industries, furnishing employment and support to millions of people, are based solely upon the utilization of forest supplies.

Colorado Forests; Their Relations to the State, and to Adjacent States and Territories.

That the sixteen thousand square miles, more or less, of forest lands in the central mountain region of Colorado bear an important relation to the State, and to adjacent States and Territories, admits of no argument. The forests in question, mostly coniferous, and already greatly injured by fire and the ax, cover the headwaters of the Rio Grande, Arkansas, South and North Platte, Yampa, White, Grand, Gunnison, Dolores, and their many tributaries. These streams, rising amid forest and snow-capped ranges, flow from several radiating centers, distributing their waters to various sections of Colorado, and to the neighboring States and Territories.

Colorado occupies a central position in the Rocky Mountain region. The average altitude of the State (about seven thousand feet) is greater than that of any

other portion of the continent. In the less elevated sections of the State, and in part, at least, of adjoining States and Territories, arid or semi-arid conditions prevail. For the successful prosecution of agriculture in this region the use of water for irrigation is almost indispensable, and great irrigation systems have been inaugurated and are now in full operation. The absolute dependence of irrigation enterprises upon the streams, and the dependence of the latter upon the forests of the mountains, is now quite fully recognized. Agriculturists and irrigation companies regard the maintenance of the streams a matter of vital interest to them. Indeed, all classes are awakening to the fact that the preservation of the forests in this mountain country is a subject of the first importance. If forests are a convenience in other sections, they are a prime necessity here.

Again, the time is fast approaching when the vast power afforded by the mountain streams will be utilized in manufactures. Colorado, for so young a State, has already made commendable progress in establishing varied branches of mechanical industry. Her immense coal deposits will also greatly promote enterprises of this character.

The relation of Colorado forests to lumber and charcoal manufacture, mining, reduction of ores, railway and telegraph construction, is extremely intimate, and will become more so from year to year. For all of these industries great quantities of timber are required, and the duty of providently using the forest resources of the State can not be too strongly urged. The extensive and varied natural resources of the State, its wide area and reasonable certainty of great increase in population, justify the belief in a rapidly increasing demand for its forest products.

Although the forests of the State hold an important relation to its industrial interests, their influence in

other directions is hardly less marked. In ameliorating climatic extremes, in retarding the melting of snow, in preserving springs and rivulets—the sources of important streams, in restraining and regulating the flow of water, and in the prevention of snow and land-slides, the mountain forests are invaluable.

Another important consideration in this connection is that our native forests, wonderful natural scenery and pure atmosphere attract to our borders many tourists, invalids and sportsmen, besides the many who come here for permanent residence—a state of facts which gives renown to the State, and adds much to its material prosperity. Can these conditions be maintained if her native forests be destroyed? How desolate and forbidding would appear her mountain heights if deprived of their natural covering!

It may also be said that measures for the preservation of forests should go hand in hand with those for the protection of game and fish. All recognize the necessity and expediency of perpetuating the existence of these wild denizens of our forests and streams. National and State governments have instituted laws to that end which it is hoped may prove as efficient as they are deemed salutary.

Location and Extent of Colorado Forests.

The forests of Colorado are confined mainly to the mountain ranges, extending in a north and south direction through the central portions of the State. The western part of the Arkansas-Platte divide, originally covered with valuable forests, has but little to show for them now. Some of the plateaus and mésas in western Colorado bear a scattering growth of timber. The most extensive and valuable of the forests now remaining are

found in the counties of Archuleta and La Plata at the southward; in Montrose, Pitkin, Eagle and Garfield counties at the west; and in Routt, Larimer and Grand counties at the north.

Yellow and white pine, spruce and fir, are the predominant species of trees. The first named is the most abundant.

From data recently collected, the area of *forest lands* in the State is estimated at about sixteen thousand six hundred square miles. This estimate embraces both public and private lands; it includes all conditions of forest growth, and much territory upon which no timber whatever may now be growing, but which is properly classed as forest land. The accompanying

MAP

shows the drainage system of Colorado, and the approximate location and extent of its forest and irrigated lands. It illustrates, as well, the intimate connections existing between the forests, streams and irrigation systems of the State. Special attention is called to the fact that all streams have their sources in the forest area.

The Forest Flora of Colorado.*

The most important and valuable forest trees of Colorado are conifers; pine and spruce being the leading species. None of the native deciduous trees form forests, although groves of aspen cover large areas in the mountains, from which fires have swept the original coniferous growth. Cottonwood, aspen, box-elder and locust, (the latter in southern Colorado), are the principal broad-leaved forest trees of the State. The range of altitude of the conifers is very great, extending from about four thousand five hundred to an extreme height of twelve thousand four hundred feet above the sea.

NOTE—The following extract, from a recent letter of Capt. Edward L. Berthoud, is deemed of interest in this connection:

* * Some years ago (1875) I had occasion to be in camp on and near Argentine Pass, Colorado, ten or twelve miles from Georgetown. I then collected some facts which were deemed important enough to be published in Dana's *Journal of Science and Art*, and, being presented by Mr. Desor, a Swiss geologist, before an European scientific society, gave rise to quite a discussion. In this article I remarked, "That not over three-fourths of a mile from Mt. McClellan, the limit of tree growth exceeds twelve thousand four hundred feet on the south slope of the mountain range." Here *P. Aristata*, some trees two feet in diameter and thirty feet high, retain their hold in spite of furious gales of wind and snow and an extreme Arctic cold.

In the United States Geological Survey, by Prof. Hayden, Mr. Gardner in this report places the timber line of the mountains, between thirty-nine and forty degrees north latitude, at from eleven thousand to eleven thousand nine hundred feet. We believe this to be a close approximate average. Gray's Peak, timber line, is eleven

* A large proportion of the species found in Colorado are also common to other sections of the Rocky Mountain region. Where, however, the distribution or habitat of any species is mentioned in this connection, it usually refers to Colorado only.

For a portion of the descriptions in the subjoined list, I am indebted to Sargent's "Forests of North America" (10th Census of the U. S.), Coulter's "Manual of Rocky Mountain Botany," and the 1886 Report of the Division of Forestry (B. E. Fernow, Chief of Division,) to the U. S. Department of Agriculture. For the habitat, range of altitude, etc., of some of the species, special acknowledgment should be made to Capt. Edward L. Berthoud, of Golden; Hon. Wm. N. Byers, of Denver; and Geo. H. Parsons, Esq., of Colorado Springs.

thousand feet, as by Gardner. Gray's Peak is south-west of Mt. McClellan four or five miles. Yet in Argentine district, comprising Mt. McClellan, it is thirteen hundred feet higher. I then asked the following question:

"At the equator, in the torrid zone, the limit of pines is twelve thousand eight hundred feet altitude. How is it, then, that in thirty-nine degrees, thirty-three minutes north, in Argentine district, the limit of coniferous growth has receded only four hundred feet, namely, to twelve thousand four hundred feet?" This question has practically remained unanswered, but shows to us that latitude has less to do with timber growth than the configuration and direction of the slopes, and, above all, the question of temperature as affected by the prevailing winds, the barometric column and the air's humidity. At five thousand eight hundred feet altitude, in the San Francisco Mountains of Arizona, I see scarcely a difference in tree growth from that of Colorado to forty degrees, thirty minutes north latitude.

A. Conifers.—(Evergreens and needle-leaved trees, with a few exceptions.) The most valuable forest trees, as well on account of their usefulness as of their forestal effects, due to the evergreen foliage of the most of them; most capable of covering extensive areas exclusively, and with deciduous trees most excellent aids in forestry, on account of their habit of growth and their soil improving qualities; few capable of reproduction by sprouting from the stocks, or practically from cuttings; mostly periodical seeders; persistent growers. Distribution of species climatically confined.

I. PINES.—The most useful conifers and most important forest trees, reaching desirable development in comparatively dry, even barren, situations. Mostly light-needing; tolerably rapid growers; best on light sandy soil, with clay subsoil.

Characteristics.—Leaves arranged in twos, threes, or fives in one sheath; cones with thickened scales; seeds almond-shaped, nut-like, of mottled appearance, with their wings only lightly attached; maturing the second year, and preserving germinating power well.

YELLOW PINE.—Colorado Pine, Bull Pine. (*Pinus ponderosa*). Grows on southern slopes and dry, rocky ridges, at elevations varying from five thousand to ten thousand five hundred feet. (*Head of Clear Creek;*

San Juan Mountains, ten thousand five hundred feet. —Berthoud). Tree eighty to one hundred feet high; thick red-brown bark, deeply and irregularly furrowed; leaves three to six inches long, arranged in twos and threes; wood varying greatly in quality and value; heavy, hard, strong, brittle, resinous; largely used for lumber, railway ties, mining timber and fuel. Vigorous, rapid grower, very hardy, except when quite young. Well adapted to dry, windy, exposed places, and therefore the most promising tree for re-foresting southern exposures of the western mountain regions. Though often making a vigorous growth in dry and exposed situations, it reaches fullest development only in places somewhat moist and sheltered.

WHITE PINE.—(*Pinus flexilis*). Dry, gravelly slopes and ridges between seven thousand and eleven thousand feet elevation; fifty to seventy-five feet in height—smaller than the yellow pine, and wood inferior; furrowed gray bark; leaves in fives, one and a half to two inches long, wood light, soft, compact—used for various domestic purposes.

BLACK PINE. —Lodge-pole Pine. (*Pinus Murrayana.*) Northern Colorado, up to eleven thousand feet elevation (*Boulder Pass—Berthoud*), in dry, gravelly soil; trees standing closely together and growing small and slender—quite tall; leaves one to three inches long; wood light, soft, not strong; compact, not durable; occasionally manufactured into lumber, and also used for railway ties, fuel, etc.

FOX-TAIL PINE.--(*Pinus Balfouriana*, var. *aristata*). Local; found in Colorado at elevations between seven thousand and twelve thousand four hundred feet.* Like other pines of the region it seeks the dry and gravelly slopes and ridges. Tree fifty to one hundred feet high;

*See note on page 9.

bark rough and dark in color; leaves arranged in fours and fives, one to two inches long; wood light, soft, weak, brittle—according to some authorities, hard, tough, durable; susceptible of a good polish. Important for reforestation of southern exposures and higher elevations in the mountains.

PIÑON.—Nut Pine. (*Pinus edulis*). Quite generally distrbuted through southern, central and western Colorado—extending northwest at least to the divide between White and Yampa rivers—not found on the waters of the Platte; dry mésas and foot-hills; range of altitude from six thousand to nine thousand five hundred feet. A short, round-topped tree, low branched, height from twenty to forty feet; leaves mostly in pairs —rarely in threes; wood light, soft, brittle, not strong; durable in contact with the soil; most excellent for fuel—the best of the mountain species; largely used in the manufacture of charcoal; the tree bears a small edible nut, which is sweet and palatable.

II. SPRUCES.*—Next in importance to the Pines. The wood is less resinous, and usually weaker and less durable. Of northern or mountain habitat, in cool situations and moist soils; shade enduring, and mostly rapid and persistent growers.

Characteristics.—Leaves single, needle-shaped, four-sided; bristling mostly all around the twigs. Cones long, hanging, with thin persistent scales. Seeds resembling those of the pines, but usually smaller, more uniform in color, and angular; mature the first year, and preserve power of germination well. Mostly periodical, but abundant seeders. Pyramidal in form, with beautiful foliage.

ENGLEMANN'S SPRUCE. White Spruce. (*Picea Engelmanni*). Quite generally distributed throughout the higher mountain districts; partial to northern slopes,

*In describing the Spruces of Colorado, I shall for the present adhere to the classification given by Coulter, who names three species, *Picea Engelmanni*, *P. pungens* and *Pseudotsuga Douglassi*. Sargent places the latter among the Firs, and Mr. B. E. Fernow, Chief of the United States Forestry Division, calls it a bastard Spruce.

Mr. George H. Parsons, late President of the Colorado State Forestry Association, believes there is but one distinct species of Spruce in the State, the green, or Englemann's, making the blue Spruce a variety, or "sport," of the green, as it does not seem constant in the forest. Veitch, in his "Manual of Coniferæ," adopts this classification, and calls the Blue Spruce *picea Engelmanni glauca*.

moisture and shade. It grows freely in barren, gravelly soils, and forms dense forests next below the naked mountain summits, or at "timber line." Its range of altitude is from seven thousand to twelve thousand feet; its extreme limit of growth being exceeded in case of the Fox-tail Pine only. Tree large, eighty to one hundred and twenty feet in height, with a trunk two to four feet in diameter, or at its extreme elevation reduced to a low, prostrate shrub. Bark thin, scaly, reddish or purplish brown; leaves one-half to one-quarter inches in length; wood light, straight-grained, tough, durable, strong and elastic. Extensively used for domestic purposes (not for fuel), railway ties, telegraph poles, etc. One of the most valuable timber trees of the Central Rocky Mountain region; specially adapted for use in reforesting the higher mountain slopes.

DOUGLAS SPRUCE—Douglas Fir. (*Pseudotsuga Douglasii*). This, in common with the species last described, has wide distribution in the State. It, as well as the other, seeks high elevations (seven thousand to eleven thousand five hundred feet), and prefers the shade and coolness of northern slopes, although it is said to do well on dry soils and in exposed situations; a rapid grower. Not so large a tree as the Englemann Spruce; erect and symmetrical in form; thick, brown bark; leaves flat, linear, from three-fourths of an inch to one inch or more long; fringed appearance of cones. Wood hard, strong, durable, varying greatly with age and conditions of growth; in density, quality and amount of sap; color varying from light red to yellow, the sap-wood mostly white. Used for lumber, various domestic purposes, mining timber, railway ties and telegraph poles.

NOTE—I can not, as yet, clearly distinguish between the Englemann and Douglas spruces, nor am I certain as to which of the two our woodsmen give the name of "Red Spruce;" in fact both kinds may be so designated by them.

Capt. Berthoud says, "Red Spruce is the best timber we have in Colorado, Wyoming, Montana or Idaho. In Deer Lodge (Mont.) I have seen plank three and a half feet wide by three inches thick, without a knot."

BLUE SPRUCE.—Silver Spruce. (*Picea pungens.*) Rare and local, not forming forests; quite prevalent in the Pike's Peak region and occasionally seen on the western slope of the main range; found in moist situations, at elevations varying from six thousand to eleven thousand feet. The tree is tall and symmetrical—one of the most beautiful of the Rocky Mountain species; more densely blue in color than the other spruces; foliage rigid to the touch; wood light, soft, and of little value for mechanical purposes.

"This matchless spruce has a foliage hard to describe. It is something like a steel or frosted green. It looks as if a soft, blue, silver powder had fallen upon its deep, green needles, or as if a bluish hoar frost, which must melt at noon, were resting upon it."

NOTE.—The existence or non-existence of WESTERN HEMLOCK (*Tsugu Mertensiana*) in Colorado is a question which is still undetermined. In collecting data concerning the forest flora of the State, Larimer county is the only one in which its existence was reported, I am not personally familiar with the tree. Coulter does not give it in his "Rocky Mountain Botany." Sargent, in "Forest Trees of North America," locates it in western Montana, Idaho and California, but not in Colorado. My correspondents in Larimer county have recently written upon the subject as follows:

"I have seen in the mountains, at from six thousand to seven thousand feet elevation, what I supposed was the same as our New England hemlock. I am not skilled to the extent of knowing whether it is the 'Simon pure' or not. It is found on no thern slopes among the spruce and cedar."—*R. Q. Tenney, Fort Collins.*

"Hemlock Spruce is found in limited quantities in the mountainous portions of Larimer and Boulder counties, Colorado, at an altitude of from six thousand to eight thousand feet. The largest quantity of that timber that ever came under my observation I found in townships one and two, north of ranges seventy-one and seventy-two west. This was in 1874. Since then most of the timber has been cut out and hauled away by farmers for posts and fencing material. The trees frequently reach a height of fifty feet."—*E. Loescher, C. E., Loveland, Colorado.*

III. FIRS.—Important to forestry mainly on account of their great shade endurance. Of northern and mountain distribution; still more dependent on moisture of climate, and cool, or at least evenly-tempered situations, than the Spruces, and in their youth mostly less hardy; usually slow, but persistent growers. Some exotics seem to be of more value than the native species (*Abies Nordmanniana*).

Characteristics—Leaves single, flat, rather blunt, arranged somewhat comb-like on the twigs. Cones cylindrical, standing erect on the branches; scales thin and falling away when mature; seeds triangular, partly enveloped by a more or less persistent wing; mature first year, but do not preserve their power of germination well. Frequent and abundant seeders. Crown conical. About eighteen varieties known, of which eight are indigenous to the United States. Two varieties only have been detected in Colorado.

WHITE FIR.—Balsam Fir. (*Abies concolor.**) Of somewhat wide distribution in the State, but not forming forests, nor predominant in any section. Moist slopes and cañons, between seven thousand and nine thousand feet elevation; cool and shady situations. Trees eighty to one hundred feet high, of pyramidal form and rapid growth, but with brittle and easily decaying wood. Rough, grayish bark, varying somewhat in the color and length of leaves, habit, etc., and, perhaps, merely a southern form of the nearly allied "White Fir" (*A grandis*) of the north-west, from which it can not be always readily distinguished. Less valuable for timber than for other purposes. One of the most beautiful trees of the region, and highly prized for ornamental purposes.

BALSAM.—(*Abies subalpina.*) On the high mountains, and near timber line; generally scattered, and rarely forming the prevailing forest growth. Tree sixty to eighty feet high, with very pale and thin, smooth, or only in very old trees cracked and ashy-gray bark; leaves dark green above, sharp pointed; cones purplish-

*Picea, or *Abies concolor*, was sent by Engelmann from Colorado to our nursery (Flushing, N. Y.,) and grown from seed there. These were supposed to be the only specimens out of the Rocky Mountains, and were therefore named "*Picea Parsonsiana*." But it seems to have been also sent to Europe, where it received other names, which were afterward given up, and "*Concolor*" adopted.—*George H. Parsons.*

brown, with scales nearly circular in outline, or sometimes quadrangular, one-half to three-fourths inches long and broad. Wood very light, soft, not strong, rather close-grained, compact, light brown or nearly white in color.

IV. CYPRESS FAMILY.—Under this head are grouped the cedars, junipers and California redwoods. They are characterized mostly by the shingle-like arrangement of their small, scaly leaves, the small, roundish fruit (a cone, or berry-like), and by the usually upright habit of the branches, and scanty fall of leaves. Of the many species contained in seven genera, but fourteen are found in the United States, and four or five only have been detected in Colorado.

From sixteen counties, in the southern and western portions of the State, reports have been received showing the presence of cedar (varieties not given). One county only (Saguache) names juniper as forming a part of its forest flora. In none of the reports has a clear distinction been made between cedar and juniper, and it is likely the two have been sometimes confounded.

Although this species generally prefers moist and sheltered situations, the few kinds indigenous to Colorado (excepting the creeping juniper) are generally found on the dry and gravelly foot-hills and mésas, at altitudes varying from four thousand five hundred to seven thousand five hundred feet.

RED CEDAR.—(*Juniperus Virginiana.*) "The largest of the junipers. Our widest spread species, with almost a continental distribution; the region from Arizona to Utah, California and Oregon alone being excepted." In Colorado it has been observed, as yet, only on the foothills and mésas of the southern and western portions, where it obtains only partial development. The tree is usually of pyramidal form—sometimes with rounded spreading top, with shreddy bark, and red, aromatic heartwood; branchlets slender, four-angled, with obtuse or acutish leaves *having entire margins*, berries on straight flower-stalks, one-fourth to one-half inch in

diameter, with one or two angled mostly grooved seeds. Wood light, soft, not strong, brittle, very close and straight-grained, compact, easily worked, very durable in contact with the soil; largely used for fence posts, railway ties, interior finish, cabinet work, and almost exclusively for lead pencils.

JUNIPER.—(*Juniperus occidentalis.* Var. *Monosperma.*) Eastern base of Pike's Peak and southward; also reported in Jefferson county. Distribution in the State not well determined. Dry, gravelly and rocky slopes, between four thousand and seven thousand feet elevation. A small, stunted tree, twenty to thirty feet in height, with a trunk sometimes two feet in diameter, or often branching from the ground with many stout, contorted stems; shreddy bark, and pale, reddish yellow wood; tree of scraggy growth, with short branchlets at right angles; leaves fringed on the edges, and as often in twos as in threes; berries often copper-colored, with mostly one (sometimes two or more) grooved seeds. Wood heavier than that of the type, the layers of annual growth often eccentric; used to some extent for fuel and fencing.

JUNIPERUS COMMUNIS.—With spreading or pendulous branches; leaves rigid, more or less spreading, one-half to three-fourths inches in length; fruit dark blue, one-fourth inch or more in diameter, one to three seeded. Var. *Alpina.*—Low and decumbent or prostrate; leaves shorter, one-fifth to one-third of an inch long, and less spreading.

CREEPING JUNIPER.—(*Juniperus Sabina.* Var. *Procumbens.*) Distribution in Colorado not determined; frequent in the Pike's Peak region, at elevations from seven thousand to ten thousand feet. A prostrate shrub; leaves in pairs, entire or nearly so, and opposite, closely pressed to the branch or slightly spreading, margin

slightly or indistinctly denticulate; berries one-fourth to one-half inch in diameter, with one or two, rarely three, rough seeds.

B. Broad-Leaved Trees. A strictly botanical classification will not be attempted here; but rather an arrangement conforming somewhat (in precedence, etc.) to the supposed usefulness and importance of the comparatively few species of deciduous trees native to this State.

COTTONWOOD.—Broad-leaved Cottonwood. (*Populus monilifera*). "The common cottonwood of Texas and the western plains, bordering all streams flowing east from the Rocky Mountains." Not found at high altitudes. Adapted to a variety of soils, but best in a moist, strong, loamy one.

A large tree, eighty feet high and upwards, with a trunk two to six feet in diameter; mostly angular branches; leaves broad and heart-shaped; wood light, soft, not strong, liable to warp in drying, difficult to season, not durable when exposed to moisture. Used in the manufacture of paper-pulp, and to some extent for lumber, fencing and fuel. The tree is an exceedingly rapid grower; sprouts vigorously from the stump; light-needing; thinning out rapidly; short-lived and exhaustive to the soil. Produces abundant shade; the "pioneer" shade tree, for planting in the towns and villages of this region. Recommended for planting on the plains, chiefly on account of its rapidity of growth, ease of procuring plant material, and of propagation.

WHITE COTTONWOOD.—(*Populus Fremontii.* Var. *Wislizeni*). "A large tree, seventy to eighty feet high, with a trunk three to five feet in diameter; borders of streams; the prevalent Cottonwood of the arid southwestern region - largely planted as a shade tree and for fuel." Indigenous in southern Colorado; wood light, soft, not strong nor durable in contact with the soil.

BLACK, OR NARROW-LEAVED, COTTONWOOD.—(*Populus angustifolia*). Quite common throughout the Rocky Mountain region, bordering the streams at altitudes between six thousand and ten thousand feet. A small tree fifty to seventy feet high, with a trunk rarely exceeding two feet in diameter; wood light, soft, weak, not durable; one of the least valuable of the species.

BALSAM.—Balm of Gilead. (*Populus balsamifera.* Var. *candicans*). Range quite extended in the mountain region. Like others of the species, it is partial to river bottoms and borders of streams. Attains medium size; wood very light, soft, not strong, compact; color brown, the thick sap-wood nearly white; not valuable for timber, but quite useful for fuel; the buds covered with a resinous exudation, and occasionally used medicinally as a substitute for turpentine and other balms.

ASPEN.—Quaking Asp. (*Populus tremuloides*). Said to be the most widely distributed North American tree. In the Rocky Mountain region, at altitudes between six and ten thousand feet, it covers enormous tracts from which the original coniferous growth has been swept by fire or the axe; partial to northern slopes. Trees twenty to seventy-five feet high,* with smooth, greenish-white bark; leaves roundish, heart-shaped, with a short, sharp point, and small, somewhat regular teeth, smooth on both sides, with downy margins. Wood light, soft, relatively strong, containing, as does that of the whole genus, numerous minute, scattered, open ducts; elsewhere largely converted into wood-pulp, a substitute for rags in the manufacture of paper; in the Pacific region sometimes used for flooring, turning, fuel, etc. A bitter principle in the bark causes its occasional use as a tonic

*The Aspen grows to a large size in this region. I have seen many at least two feet—and sometimes thirty inches in diameter—and probably seventy-five feet high, being large enough for saw-logs for a length of fifty feet. It makes fairly good lumber, resembling somewhat the basswood of the Eastern States.—*Preston King, C. E., Egeria, Routt county, Colorado*

in the treatment of intermittent fevers and cases of debility. Though short-lived, and not of great value for general purposes, its economic value, in the conservation of moisture and preparing the ground for higher forms of tree growth, is very great. Its seasoned wood makes excellent fuel for cooking purposes, and the poles are used to some extent for fencing. In the autumn its bright yellow and red foliage makes vivid and pleasing contrasts with the deep green of the coniferous forests.

BOX ELDER.—Ash-leaved Maple. (*Negundo aceroides*). One of the most widely distributed trees of the American forest; in the Rocky Mountain region found in valleys at elevations between five thousand and six thousand feet. Detected in many portions of the State, but habitat not fully determined; does not form close growths or forests. A tree thirty to sixty feet in height, with a trunk two to three feet in diameter; light green twigs and delicate, drooping clusters of greenish flowers, a little earlier than the leaves; fruit widely divergent, two-winged above, separable at maturity, each one-seeded. Wood light, soft, not strong, inferior, occasionally nsed in the interior finish of houses, for woodenware, cooperage and paper-pulp. Small quantities of maple sugar are sometimes obtained from this species. Rapid but not persistent grower; sprouts well from the stump, hardy. Best on low, rich ground, but will succeed on upland. For forestry purposes, useful as nurse and soil cover.

DWARF MAPLE.—(*Acer glabrum*). Widely distributed throughout the mountain region, growing in sheltered cañons and on moist slopes. A small tree, ten to twenty feet high; in its natural state, branching from the ground, and sending up many slender and graceful stems; wood heavy, hard, close-grained, compact. Tree very hardy, and often transplanted for ornamental purposes.

LOCUST.—(*Robinia Neo-Mexicana*). Southern Colorado (four thousand five hundred to seven thousand feet altitude), reaching its greatest development in the valley of the Purgatoire river. A small tree, twenty to thirty feet in height, with a trunk eight to ten inches in diameter; towards its upper limit of growth reduced to a low shrub; often with curved, sharp and stout prickles at base of leaves; leaflets elliptical or oblong; flowers in hanging, light rose-colored clusters; pods gloved-like and hairy; wood exceedingly heavy, hard, strong, close-grained, compact, yellow in color, streaked with brown; the sap-wood light yellow.

MESQUIT.—Algaroba, Honey Pod. (*Prosopis juliflora*). Southern Colorado, but distribution not well defined. It is described by Sargent as follows: "A tree of the first economic value, sometimes thirty to fifty feet in height, with a trunk two to three feet in diameter, or much smaller, often reduced to a low shrub; on dry prairies and high, rocky plains, or west of the Rocky Mountains, along desert streams, here often forming open forests, and reaching its greatest development within the United States in the valley of the Santa Cruz and other streams of southern Arizona; in western Texas, (Fort Stockton, etc.) on account of the annual burning of the prairies, rarely three feet in height, the roots then enormously developed, often weighing several hundred pounds, forming, as they are here locally known, 'underground forests,' and furnishing the best and cheapest fuel of the region.

"Wood heavy, very hard, not strong, close-grained, compact, difficult to work, almost indestructible in contact with the soil. * * * Color, rich dark brown, or often red, the sap-wood clear yellow. * * * * Exclusively used for the beams and underpinnings of the adobe houses of New Mexico, Arizona and northern Mexico; for posts and fencing, and occasionally in the

manufacture of furniture, the fellies of heavy wheels, etc.; the best and often the only fuel of the region, burning slowly with a clear flame, and producing valuable charcoal, but unsuited for the generation of steam on account of its destructive action upon boilers.

"A gum resembling Gum Arabic is yielded by this species; the unripe and pulpy pods rich in grape sugar, edible, and furnishing valuable and important fodder."

WHITE OAK.—(*Quercus grisea*). Mountains of southern Colorado and southward, at from five thousand to ten thousand feet elevation. A tree fifty to eighty feet in height, with a trunk rarely exceeding two feet in diameter, or reduced to a low, much branched shrub. Species varying greatly in habit, and in the shape and texture of the leaves, but apparently well characterized by its *connate cotyledons* (united first leaves of the embryo); the large specimens generally hollow and defective. Wood very heavy, hard, strong, close-grained, checking badly in drying.

Both this and the "Scrub Oak" flower in the spring, and shed nuts in the fall; annual fruited, with sweet kernels.

SCRUB OAK.—(*Quercus undulata*). Eastern slopes of the Rocky Mountains of Colorado, north to the valley of the Platte river. A small tree, rarely forty feet in height, or often a low shrub, spreading from underground shoots and forming dense thickets; common to dry and rocky portions of the foot-hills. Wood heavy, hard, strong, that of young trees quite tough, close-grained, checking badly in drying; color, rich dark brown, the sap-wood lighter; used somewhat for fuel. In Utah the bark is used in tanning.

WILLOW.—(*Salix lasiandra*). Throughout the Rocky Mountain region, along the banks of streams. A small tree; leaves oval and lance-shaped, tapering to a very

long alternate point. Scarcely distinguished from *S. lucida* of the Eastern States by the narrower and less glossy leaves.

DIAMOND WILLOW.—(*Salix cordata*). "Common clear across the continent." In Colorado bordering mountain streams. Branches bronze, or yellowish-green, often bright red when exposed to much sunlight; twigs stout, suitable for the heavier kinds of basket work.

SAND-BAR WILLOW.—(*Salix longifolia*). Rocky Mountain region; a small tree, twenty to thirty feet high, growing on banks of streams and river sand-bars; often forming dense clumps; leaves varying from linear to ovate, lance-shaped, two to four inches long, and one-eighth to one-fourth inch wide, margin remotely denticulate, with projecting teeth, or sometimes entire; catkins, linear-cylindrical, often clustered at the extremity of the branchlets. Exceedingly variable in foliage, flowers and fruit. A shrub (within our limits) rooting extensively in alluvial deposits and forming dense clumps.

MOUNTAIN MAHOGANY.—(*Cercocarpus parvifolius*). Said to range from Arizona, through New Mexico and Colorado, to Wyoming and westward; distribution in this State not well determined. A small tree, rarely twenty to thirty feet in height, with a trunk sometimes a foot in diameter, but more often a shrub; dry, gravelly soil, at elevations from six thousand to eight thousand feet. Wood very heavy, hard, close-grained, compact, difficult to work, susceptible of a beautiful polish; color bright reddish brown, the sap-wood light brown; furnishes valuable fuel.

WILD PLUM.—Canada Plum. Horse Plum. (*Prunus Americana*). Central Colorado, and southward, growing along the streams. A small tree, fifteen to thirty feet in height, with a trunk six to twelve inches

in diameter; branches thorny; leaves oval, or somewhat obovate, conspicuously pointed, coarsely or doubly serrate; fruit nearly destitute of bloom, roundish oval, yellow, orange or red; pleasant tasted, but with a tough and sour skin. Wood heavy, very hard, strong, very close grained, compact, susceptible of a beautiful polish; color, rich bright brown or often red, the sap-wood lighter; used for handles of tools, etc. Often cultivated for the acid or rarely sweet fruit, and furnishing an excellent stock on which to graft varieties of the domestic plum.

CHICKASAW PLUM.—Hog Plum. (*Prunus angustifolia*). Probably a native of the eastern slopes of the southern Rocky Mountains where it is found at an altitude of seven thousand feet, and of the high plateau east and south-east of them; now quite widely distributed; generally found along streams, in rich soil. A small tree, twenty to thirty feet in height, with a trunk six to ten inches in diameter, or often a low shrub; stem scarcely thorny; leaves usually lance-shaped, finely serrulate; fruit nearly destitute of bloom, globular, red; the stone almost as thick as wide. Wood heavy, soft, not strong; color, light brown or red, the sap-wood lighter; tree often cultivated for its fruit.

WILD RED CHERRY.—Pin Cherry. Pigeon Cherry. (*Prunus Pennsylvanica*). Mountain region of the State, where it is reduced to a very small tree, or low shrub. Light red-brown bark; leaves lance-shaped, finely and sharply serrate, shining green and smooth on both sides; wood light, soft, close-grained, light-brown in color; the small acid fruit used domestically, and by herbalists in the preparation of cough mixtures, etc.

THORN.—(*Crataegus rivularis*). Mountain ranges of Colorado; distribution in the State not well determined. A small tree, or often a tall, much-branched

shrub, forming dense, impenetrable thickets along borders of streams and swamps. Stems few, short and stout; leaves rather rigid, oval lance-shaped, doubly serrate or rarely slightly incised; fruit black; wood heavy, hard, close-grained, compact, color, bright reddish brown, the sap-wood nearly white.

BLACK BIRCH.—(*Betula Occidentalis*). "Mountain cañons and along streams, in moist soil, often throwing up several stems from the ground and forming dense thickets." Becoming ten or twenty feet high, with close, dark-colored bark, at length light-brown; outer bark usually separable in sheets, that of the branchlets dotted; twigs and leaves often spicy-aromatic. Wood soft, strong, brittle, close-grained, compact; color, light-brown, the sap-wood lighter.

SPECKLED ALDER.—Black Alder. Hoary Alder. (*Aluns incana*).—Borders of streams and swamps. A small tree, eight to twenty feet in height, or more often a tall, branching shrub; leaves broadly oval or ovate, rounded at the base, sharply serrate, often coarsely toothed, whitened and mostly downy underneath; wood light, soft, close-grained, checking in drying; color light brown, the sap-wood nearly white; preferred and largely used in northern New England in the final baking of bricks, and occasionally used in the manufacture of gunpowder.

Reports from County Commissioners and Road Overseers.

In order to ascertain, so far as possible, the forest conditions of the several counties, and to collect information which might be useful in the future, circular letters, as given in form "A," following, were sent to the

respective Boards of County Commissioners, and letters, as in form "B" (accompanied with blank township plats), to all road overseers in wooded districts:—

FORM "A."

Office of the FOREST COMMISSIONER,, OF THE STATE OF COLORADO. DENVER, ... 188 . .

To the Board of County Commissioners of . . . . . County, Colorado.

GENTLEMEN:

In confirmity with the laws of this State, and in furtherance of its forestry interests, permit me to request that you will report to this office the forest conditions of your county.

The appended questions will indicate the nature of the desired report. Be so good as to number your replies to correspond with the several questions, and return this sheet, with your report to me.

Your prompt attention will oblige,

Yours respectfully,

EDGAR T. ENSIGN,
Commissioner.

1. To what cause, or causes, may be ascribed the principal injury to the forests of your county?

2. Have any forest fires occurred in your county during the present year? If so, please give date of their occurrence, location, approximate extent, estimated value of timber destroyed, origin of fire, if known; arrests, if any, made for setting fire, and such other useful facts in this connection as may occur to you.

3. Has the law, requiring the posting of notices warning persons of the penalties for failure to extinguish camp fires, been observed in your county? If so, has the effect been beneficial, or otherwise?

4. What expense, if any, under the forest acts, has been incurred in your county during the present year; stating for what particular purposes money may have been so expended?

5. In what manner can our State forest laws be so amended as to render them more effectual in preventing the destruction of forests?

6. In your opinion, what objections, if any, exist to the present policy of the general government respecting the public timber lands?

7. What changes in such policy, if any, are desirable, in order to secure better protection and better utilization of the forests on the public domain?

8. To what extent have shade and forest trees been planted in your county? Can you suggest any measures in that connection, the adoption of which might encourage or promote such action?

FORM "B."

Office of the FOREST COMMISSIONER OF THE STATE OF COLORADO, DENVER . . . . . 188 . .

Mr . . . . . *Road Overseer,*

. . . . . *County, Colo.*

DEAR SIR:

In furtherance of the laws enacted for the protection of the forests of the State, and to promote the planting of forest trees,* I beg leave to request that at your early convenience you will reply to the questions hereto appended, and return the report to me in the enclosed envelope.

Your prompt attention will oblige

Yours respectfully,

EDGAR T. ENSIGN,

Commissioner.

1. What are the principal species of trees comprising the forests of your district? Name them in the order of their importance . . . . . .

Please sketch on the enclosed township plats the approximate location and extent of such forests. Give the *numbers* of townships and range. Return plats with your report.

2. At what points in your district, if any, are notices posted warning persons of the penalties for failure to extinguish camp fires? . . . . .

3. To what cause, or causes, may be ascribed the principal injury to the forests of your district? . . . .

* See pages 161, 164 and 299 of the Session Laws of 1885, and page 449 of the Session Laws of 1887.

Responses to the foregoing circulars were received from all of the counties, and from a majority of the road districts. The replies, though not in many cases very complete, embodied a mass of useful facts relating to local forest conditions. In the table hereto appended is given a summary of the information so obtained:

CON

ES UNDER ST ACTS.		REMARKS.
		nty.
		mbustible matter in forests; danger from fire imminent.
		nty; planting usually done with the aid of irrigation.
		ave been largely depleted, but few remaining.
		ffer greatly from charcoal burners.
		d from scarcity of water and difficulty of irrigation.
		ot greatly injured; tree planting needed in the valley.
		nat difficult by reason of the high altitude.
		y needed; for its encouragement a rebate on taxes is suggested.
	1888	ty mountainous and wooded; western part open and adapted to cultivation.
	1887	ber-culture entries the period of planting and number of trees be reduced.
		in western part adapted to tree culture.
		deeply, plant in the spring (with no other crop) and cultivate thoroughly.
	1887	ber is great and the public forests are not properly protected.
		ping and charcoal burning are the most destructive agencies.
		county is found in north-east portion.
		and altitude too great for successful tree culture.
		mber is situated on the surrounding mountains.
	1887	ounty is less in altitude than the remainder and better adapted to tree culture.
	1887–8	ainous and quite well wooded.
		eing done, especially on timber-culture claims.
		as been destroyed; a small second growth has started.
	1888	gation in this county will be likely to promote tree planting.
		ve suffered greatly. A number of timber-culture claims have been started.
		nty.
		od grows freely along streams and irrigating ditches.
		d better kinds of shade trees have been planted.
	1888	nous and pretty generally wooded.
		r lands at heads of streams should be withdrawn from entry or sale.
		ed over the county, but heaviest in the mountains.
		cedar and pifion: when destroyed renewal, if any, is very slow.
		filled with combustible material left by tie-choppers and others.
	1887	alf of the timber in the forest area has been killed by fire.
		of the county is adapted to arboriculture.
		, end of the county is agricultural and adapted to tree culture.
		d presence of native forests renders tree planting inexpedient.
		nty, which is situated in the plains region.
		nty.

Destructive Agencies.

FOREST FIRES.—In naming those causes which tend to the destruction of forests in this State, *fire* has usually taken precedence of all others. It is believed, however, that the magnitude of this evil has been greatly diminished during the last few years; owing in part to the efforts of the public authorities to prevent the outbreak and spread of fire and in part to an improved public sentiment respecting the conservation of forests, leading our people to exercise greater vigilance in preventing the setting of fires likely to injure forest growth.

In this connection circular letters, as given below, have from time to time been sent to the County Commissioners and Road Overseers throughout the State. The circular has also been quite generally published by the State press:

[Circular No. 5.] *Office of the* FOREST COMMISSIONER OF THE STATE OF COLORADO, DENVER, July 6, 1887.

To County Commissioners and Road Overseers:

GENTLEMEN:

Under the laws of this State you are constituted forest officers in your respective counties and districts. It is made your duty to prevent, by all proper means, the destruction of forests upon the public lands within the State, and to furnish the State Forest Commissioner with such information, relating to local forest conditions, as he may from time to time require.

Although the State has not actual jurisdiction over the public timber lands, the fact is recognized that the destruction of the forests upon such lands is productive of great evil. In conformity with the spirit of our statutes, the State authorities should make every effort to protect the forests, and should also heartily co-operate with the federal officers in that behalf.

Your attention is called to the acts found on pages 161, 164, and 299, of the Session Laws of 1885, and on page 449 of the Session Laws of 1887.

Permit me to suggest:

1. That in compliance with the Statutes, printed notices be conspicuously posted, in your county, substantially in the following form:

"FIRE."

"Camp fires must be totally extinguished before breaking camp, under penalty of not to exceed one month's imprisonment, or one hundred dollars fine, or both, as provided by law.

. . . . . } *County*
. . . . . } *Commissioners.*"

Such notices should be printed upon strong cloth, or canvass, be provided at the expense of the several counties, and duly posted by the Overseers of the respective road districts.

2. Forest fires annually destroy more timber and young forest growth than all other causes combined. Therefore, you should endeavor to impress upon the people of your county, the urgent necessity of guarding against the inception or spread of such fires.

3. Should any forest fires occur during the season, a report of the same, including their origin and extent, measures taken to suppress, loss incurred, etc., will be required by the Forest Commissioner.

Respectfully,

EDGAR T. ENSIGN,
Commissioner.

Subsequently, personal letters were written by me, and forwarded to the respective Boards of Commissioners in each of the timbered counties. The communication was substantially as follows:

"Now that the dry season is at hand, and danger from forest fires more or less imminent, I trust you will take every necessary precaution to prevent such disasters in your county. Should any such fires occur, prompt and vigorous action for their suppression, and the arrest of parties causing the same, will be expected on the part of the local forest officers."

Copies of the following letter were also forwarded to the county forest officers, and the communication was printed in many of the State papers:

"FOREST FIRES."

HOW TO FIGHT THEM.

The following letter from Hon. John Curr, of Colorado Springs, to the State Forest Commissioner, will be of general interest:

"In reply to your letter of inquiry in regard to the extinguishment of forest fires, I would say, from my own experience on Cheyenne Mountain last winter, that when the fire has got good hold on a close piece of timber it is useless to try to put it out there; but unless a very strong wind is blowing it may be confined there by back-firing in a circle. This is easily done after the fire has made considerable progress, as the upper draft caused by the fire is so great that it makes a strong inward current of air on all sides of the fire.

"A fire brigade, organized to put out a forest fire, needs plenty of matches and corn sweeping brooms that have bean soaked in a strong salt brine, (the brooms are thus rendered less inflammable). Gunny sacks treated in the same manner will answer, but the brooms, if they can be had, are better, as one can whisk out the outer edge of the back fire circle much quicker with a broom. A few hay forks or hand rakes ought also to be provided. A posse of twelve men ought to have at least two of their number who know enough of the forest to know where to circle around the fire by the nearest open spaces. The two men who know the ground best should start from the same point, each trailing a lighted torch (pitch pine or bunches of long grass will answer), and move in a circle around the fire. Three men follow close after each fireman, whisking out the fire with their brooms from the outer edge of the circle. One man will be needed with each fireman to supply fresh torches, and one man ought to remain two or three hundred yards behind the other men, who are whisking out the fire, as it sometimes will happen that the outer edge of the circle will start up and blaze again some little time after the fire has apparently been extinguished.

"When the circle has to go through brush with leaves under, or open trees with spines underneath, it is better to first fork or rake the spines or leaves to one side of a narrow strip, and then fire on the inside of the strip. When the circle has been completed around the fire, it must burn out inside the circle."

In addition to the foregoing, private letters have been sent to individuals in different parts of the State, re-

questing them to inform me of any forest fires of which they might receive intelligence.

So far as has been reported to, or become known to me, but few extensive forest fires have occurred in the State during the last two years. There is, however, abundant cause for anxiety as to the future. Railway tie-choppers, lumbermen and others have never been more numerous and active than during the last two years. They have invaded the forests from all sides, leaving behind them a mass of combustible material, which, sooner or later, will cause great loss and destruction. Prior to recent snows in the mountains (October, 1888), danger from fire was imminent in many localities.

I have endeavored to obtain from County Commissioners and others detailed statements respecting fires of this character, but have met with only partial success. The indifference with which this subject is still treated by many, even among those whose local and pecuniary interests suffer thereby, is remarkable.

Such meagre accounts as I have been able to obtain in this connection are appended hereto, the several counties, for convenience, being given in order:

CHAFFEE.—To a communication addressed to J. A. Israel, chairman of the Board of County Commissioners, Salida, concerning certain reported forest fires in that county, the following reply was made:

SALIDA, COLO., December 16, 1887.

DEAR SIR:—Replying to yours of the fifth instant, I have made diligent inquiry regarding the fires which occurred on the eastern slope of Mt. Ouray, commencing about November 8, and lasting about a week. The fire originated above the head of Cochetopa creek and extended down a gulch toward Poncha creek, and burned over an area of forty or fifty acres, The territory burned over was covered with logs, and dead and green aspen thickets. There was no valuable timber destroyed. I have my information from two thoroughly reliable gentlemen who have been over the ground since the fire, and were familiar with it before. The probability is that the fire started

from the camp-fire of some herder or cattle-man, camping on the range; it is impossible to tell how. With reference to the fire you speak of near Salida, to the south-west, will say that I have not seen or heard of it before or since the receipt of your letter; neither have I found any one who did see it. Think it is a false report.

CLEAR CREEK.—The following letter from Ernest Le Neve Foster, chairman of the Board of Commissioners of Clear Creek county, sets forth fully the facts concerning a recent forest fire in that section:

GEORGETOWN, COLO., Oct. 10, 1888.

DEAR SIR—Yours of the third inst. was duly received. Inquiry into the matter elicits the information that for some two or three months past a slight fire in the fallen timber and undergrowth was known to exist on the north fork of South Clear creek; but not even those living in the immediate neighborhood took the trouble to extinguish it, and two or three weeks ago it developed into a large forest fire. From the best information I can get, there has been destroyed from one thousand five hundred to two thousand acres of good timber, the fire extending from the creek to timber-line. It seems to have originated from an unextinguished camp fire, but the guilty parties are unknown, and consequently no arrests have been make. The fire is now extinguished.

CONEJOS.—No report has been received from the County Commissioners for the current year. John C. Games, Road Overseer, Cockrell, reports two forest fires near the headwaters of La Jara creek, in June and July last. One fire continued for a month or more, and burned over several thousands of acres of timber. The other lasted for two weeks, and extended over several hundred acres. Origin and extent of loss unknown. The fires were finally checked by rains.

CUSTER.—In the latter part of November, 1887, a fierce fire in the south-west corner of Custer county destroyed quite a body of timber; extent of fire and amount of loss not given. Origin of fire unknown.

EAGLE.—In the early part of November, 1887, I was informed that a forest fire had occurred about the tenth of the preceding August, in Eagle county, at or near Eagle Park, in the vicinity of Red Cliff. I was unable,

however, to obtain from the Commissioners of that county any definite information relating to the supposed fire.

ELBERT.—A fire in Elbert county, on the line of the Denver, Texas and Gulf Railroad, said to have been caused by sparks from an engine, damaged private woodland, causing a loss of about $100. This occurred in the fall of 1887.

EL PASO.—In March, 1887, quite a heavy forest fire occurred at the base of Cheyenne Mountain, about six miles south of Colorado Springs, on the land of Hon. John Curr. It was caused by the carelessness of a man who was smoking a pipe. By some means the heavy dry grass near which he was standing ignited, and the fire spread so rapidly that all immediate efforts to extinguish it failed. After strenuous exertions, continuing through two days and nights, and by the setting of back-fires, etc., the fire was finally subdued. Between three thousand five hundred and four thousand acres were burned over, causing an estimated loss of $5,000 to $8,000. The person who started the fire would have been prosecuted had he not, by an early flight, evaded arrest.

On the fourth of July, 1888, a fire was started by campers in Queen's Cañon, at Glen Eyrie, the residence of Gen. Wm. J. Palmer, near Colorado Springs. Employés on the place made ineffectual attempts to extinguish the flames. No rain had fallen for several weeks previous, the mountain side was extremely dry, and the fire burned fiercely in the undergrowth and among the green cedar and spruce trees. No large timber was in the path of the fire. The County Commissioners being notified of the existence of the fire, sent persons to view the situation, but deemed it impracticable to take further action. Fortunately, after some days a rain-fall oc-

curred, and the fire was thus prevented from spreading to the adjoining mountains. An area of about two miles square was burned over. Unavailing efforts were made to discover and apprehend the authors of the fire. The injury occasioned in this instance can not well be estimated in dollars and cents; the burned tract covered, to some extent, the sources of springs furnishing the water supply for Glen Eyrie and adjacent lands. The loss is irreparable, at least in so far as concerns the present generation.

GRAND.—It was reported to me that a forest fire occurred in August, 1888, on William's Creek, near Coffee's, in Grand county. I have been unable, however, to obtain any particulars concerning the same, from the County Commissioners or others.

GUNNISON.—Mr. A. K. Stevens, chairman of the Board of Commissioners of Gunnison county, reports one forest fire as having occurred in the county the present (1888) season. He states that it was caused by the Denver and South Park Railway Company, but gives no further particulars.

HINSDALE.—The following letter from John Maurer, chairman of the Board of Commissioners of Hinsdale county, comprises all the information I have in relation to the fire there:

One fire occurred this year, of small proportions, however. It was early in July, (1888); location about three miles north of Lake City—extending over two or three hundred acres, but mostly underbrush, where the timber had been cut several years ago. Diligent efforts were made by the Commissioners to trace the origin of this fire, but sufficient evidence was not obtained to justify the arrest of any one.

JEFFERSON.—In the early part of December, 1887, I observed the following item in the *Denver Republican:*

Forest fires in the mountains west of Denver, Golden and Central are common during the winter. They probably are caused by the carelessness of campers, who leave their fires burning. It is time an

example was made of several such lazy, indifferent fellows. They do not care whether the forests are burned or whether they are not. They care nothing about the effect of forest destruction upon the climate of the State, and upon the possibility of irrigating. They think only of their own comfort, or else they do not think at all. Because by leaving a camp fire burning in the morning, they may avoid the labor of putting it out—they go away, letting it burn. If a few of them were vigorously prosecuted the others would learn a lesson valuable to themselves and to the State.

I at once wrote to the several Boards of Commissioners of Jefferson, Clear Creek and Gilpin counties, calling attention to the printed statement, and requesting them to take such steps in the premises as were necessary and proper.

I had in the preceding month also written to the authorities of Jefferson county, inquiring as to a forest fire supposed to have occurred in the mountains west of Littleton, in the vicinity of Estabrook Park, in the southern part of the county.

Under date of December 10, 1887, Mr. Al. Townsend, the Clerk of Jefferson county, wrote me as follows:

In reply to your letter of the third inst. to the Board of County Commissioners of this county, in regard to forest fires in this county, none have occurred to the knowledge of the Board. The cause of smoke seen in our county, so far as learned, has been by settlers clearing up lands. I have traveled nearly all over this county this fall and have failed to observe any timber destroyed by fire this season.

My communications to the Boards of Commissioners of Clear Creek and Gilpin counties were not answered.

PITKIN, OR EAGLE.—The *Denver Republican* of July 18, 1888, contained the following item:

GLENWOOD SPRINGS, July 17.—[Special.]—An extensive forest fire was raging to-day at Sellar, below Loch Ivanhoe, on the Frying Pan, along the line of the Midland road. There is a large and excellent body of timber hereabouts. Some of the finest saw-logs in Colorado are here to be seen. If this conflagration continues it will prove quite disastrous to the timber interests of this section. All that can now stop it is a good rain, which is very greatly needed. In all probability it caught from a spark from a passing locomotive.

This was succeeded after a few days by a paragraph as follows:

Above the stone quarries on the Frying Pan there is quite a lumber industry. Nowhere in the mountains of Colorado is there a better growth of timber than here. Many of the saw-logs measure four feet in diameter, which are gigantic for the Rockies. Much timber of value has been destroyed the last few weeks by fires, notices of which have been published in *The Republican*. The one at Sellar, on Monday, has been gotten under control. The damage it inflicted did not prove as serious as it one time threatened.

By correspondence with the authorities of Garfield, Eagle and Pitkin counties, I endeavored to ascertain the exact location of the fire in question, and to obtain a detailed report of the same. My efforts, however, were vain. The commissioners of Garfield county stated that no part of the Frying Pan was in that county, and that no forest fire had occurred in that county. No replies to my communications were received from Eagle and Pitkin counties. In a report from the commissioners of Pitkin county, of date October 12, 1888, it was said that no forest fires had occurred in the county during the year. The whole question, therefore, is still involved in doubt.

RIO GRANDE.—James Boyd, road overseer of District No. 3, Rio Grande county, under date of July 14, 1888, informed me that a forest fire had been burning for a long time in Whiteman's Gulch, about five miles east of Summitville. Origin of the fire unknown. On the twenty-second of July he wrote me that the fire had been quenched by a rain; that it was principally in dead timber, but a few acres of green timber having been destroyed.

In a subsequent communication from R. C. Nisbet, chairman of the Board of County Commissioners, it was stated that the board had caused to be posted on the public roads a large number of notices warning persons of the penalties for failure to extinguish camp-fires.

That owing to the extreme dry weather a forest fire had occurred in the southern part of the county, but that a welcome rain soon extinguished it. It was stated, further, that the railroads destroyed yearly a large amount of timber in the county in obtaining cross-ties, and that they left behind them such a mass of tops, brush, etc., that a fire once started would be likely to sweep a large area of country.

SUMMIT.—Several forest fires have occurred in Summit county during the present year (1888). One was on Rocky Point, about two miles south-east of Breckenridge. It burned for several days, totally destroying some eighty acres of timber and badly damaging two hundred more. It occurred about the last of June, and was supposed to have been caused by tie choppers. An opportune rain extinguished it.

Another fire, about June 20, was at McLeod's cabin, a mile and a half south of Breckenridge. It was caused by campers, burned three days and destroyed fifty acres and upwards of good saw timber. Other fires in the county, of minor importance, were not reported to me in detail.

No doubt other forest fires than those named above have occurred in the State during the last two years, but I have no account of them.

One significant fact in this connection is that no *arrests* have been made for causing such fires, or for leaving camp-fires unextinguished, for which statutory penalties are provided. This need not, necessarily, cast doubt upon the zeal or efficiency of the forest officers. These fires often, or usually, break out in remote places, distant from habitations or traveled roads. It may fairly be presumed that, in some instances, such fires are unavoidable, or arise from natural causes; in short, are strictly accidental. In other cases they are caused by

gross carelessness. In a few instances they are undoubtedly set maliciously. The causes of forest fires are numerous, and, unfortunately, the opportunities for detecting guilty parties, if any, are extremely limited. Under ordinary circumstances there is great difficulty in tracing the origin of a forest fire, started at some remote or obscure point.

Although Colorado has for a brief period escaped very disastrous forest fires, there is no reason to expect that good fortune to continue. Our forests are full of inflammable material, and slight causes may at any time precipitate a catastrophe.

The unprecedented drought which occurred in 1887 in the middle-western and some of the southern States, and which may be ascribed in large measure to the reckless destruction of forests—caused extensive forest fires and great loss of life and property. It has also been observed, from published accounts, that very destructive forest fires have prevailed in some of the States during the present year. The following newspaper item, relating to the forest fires of 1887, may be of interest in this connection:

It is expected that the total fire losses of the present year will exceed those of 1885, which were $19,000,000 in excess of the average yearly loss during the past decade. The terrible forest fires in northern Wisconsin and Michigan, consequent upon the protracted drought, have resulted in the loss of millions of dollars, to say nothing of the suffering and destruction of human life. Entire counties were burned over and the amount of merchantable pine destroyed is almost beyond conception. The New York Financial and Commercial Chronicle has published a volume of statistics of fire losses for 1885 and preceding years, which gives one a clear understanding of the values swept out of existence and the entirely unnecessary character of much of the sacrifice. Statistics from twenty-two States are given, which show the total losses for 1885 to have been $44,566,237. For the whole United States the losses are placed at $110,000,000, in addition to which four hundred and ninety-one lives were destroyed. This loss, although $7,000,000 less than for the preceding year, was yet $19,000,000 in excess of the average yearly loss for the past decade. During the past ten years $828,000,000 have been lost by fire.

USE OF TIMBER BY RAILWAY COMPANIES.—"All *land-grant* railroads are authorized, in the granting act, to take timber from the public land adjacent thereto, for construction purposes. This authority, however, is confined strictly to timber for construction purposes *only*, in every grant except that to the Denver and Rio Grande Railroad, which authorizes said road so take timber for repairs also.

"All *right-of-way* railroads are authorized to take timber from the public lands adjacent to the line thereof, for construction purposes *only*, under act of March 3, 1875 (Supplement to the Revised Statutes, chapter 152), as follows:

AN ACT GRANTING TO RAILROADS THE RIGHT OF WAY THROUGH THE PUBLIC LANDS OF THE UNITED STATES.

Be it enacted, etc. * * *

SECTION 1. That the right of way through the public lands of the United States is hereby granted to any railroad company duly organized under the laws of any State or Territory, except the District of Columbia, or by the Congress of the United States, which shall have filed with the Secretary of the Interior a copy of its articles of incorporation, and due proofs of its organization under the same, to the extent of one hundred feet on each side of the central line of said road; also, the right to take from the public lands adjacent to the line of said road, material, earth, stone and timber necessary for the construction of said railroad.

* * * * * * * * *

SEC. 4. That any railroad company desiring to secure the benefits of this act shall, within twelve months after the location of any section of twenty miles of its road, if the same be upon surveyed lands, and if upon unsurveyed lands, within twelve months after the survey thereof by the United States, file with the register of the land office for the district where such land is located, a profile of its road; and upon approval thereof by the Secretary of the Interior, the same shall be noted upon the plats in said office; and thereafter all such lands over which such right of way shall pass shall be disposed of subject to such right of way; *Provided*; That if any section of said road shall not be completed within five years after the location of said section, the rights herein granted shall be forfeited as to any such uncompleted section of said road.

SEC. 5. That this act shall not apply to any lands within the limits of any military park, or Indian reservation, or other lands especially reserved from sale, unless such right of way shall be provided for by treaty stipulation or by act of Congress heretofore passed.

SEC. 6. That Congress hereby reserves the right at any time to alter, amend, or repeal this act, or any part thereof.

In recent actions (two) in the United States District Court, brought by the Government against the Denver and Rio Grande Railroad Company, for cutting timber on the public lands, Hon. Moses Hallett, judge, held that the company was entitled only to a restricted use of the public timber; that neither under the general law permitting railroads to remove timber, earth and other

material from the public lands adjacent to their lines for the construction of their road, nor under the acts of Congress giving the road its franchises and privileges, has the road any right to cut and carry away timber to a distance from public lands in the construction of its lines; that the word *adjacent*, as used in the acts of Congress referred to, confers the right to take timber from public lands some distance from the right of way, and probably within ordinary transportation by wagon; that "The acts of 1872 and 1875 contemplate the use of material from public lands while the road is in process of construction; and afterward for repairs under the act of 1872, within such convenient distance from such lands as may be reached by ordinary transportation of wagons and not otherwise; the use of the road in carrying such materials to points distant from the place of taking is not within these acts. For timber taken from public lands and carried to points remote from the place of taking, whether used by defendant corporations or by others, defendants are liable in trespass for its value."

On appeal to the United States Circuit court, the judgment of the lower court was modified, it being held by Judge Brewer that the railroad company had a right to use the public timber on lands adjacent to and along the line of its road; that the grant was in aid of the construction of the road as a whole, and might be filled out by lands anywhere along its line; that the construction of each section (of say twenty miles) need not be taken separately, nor the use of material be limited to land directly opposite the respective sections.

On page 80 of this report may be found certain extracts from the rules and regulations of the Secretary of the Interior, and from judicial opinions and decisions, relating to the use of public timber and other material by railroads.

The wide extension of the railway system of the State during the last few years, has caused a large consumption of native timber and great injury to the forests. The heaviest draft thus made is for timber for railway cross-ties. For this purpose young, thrifty and partly grown trees are mostly used, the natural consequence of which is great waste and loss. In some sections, outside of this State, cross ties are often sawn from clear timber, and as in most instances no profitable use is made of the remaining portions of the tree after the tie material is exhausted, this is also a wasteful method.

It may be conceded that, for the proper development of this region, it is needful to draw quite heavily upon the forests of the mountains. On the other hand, it is the part of wisdom to use these resources prudently, and not so as to speedily exhaust them. In my opinion laws should be enacted to more efficiently restrain corporations and individuals from the reckless and improvident use of public timber, and to secure to the general government a fair and reasonable compensation for all such timber converted to private use. At least, the government should derive sufficient revenue from its forests to defray the cost of their maintenance.

Besides the direct losses caused by tie choppers and others, the secondary and consequent loss occasioned by forest fires is very great.*

**Extract from letter dated Dec. 7, 1887, of Hon. Alonzo Hubbard, Chairman of the Board of Commissioners of Rio Grande county:*

* * No forest fires have occurred to do any considerable damage in the county; but scores of men have been employed by contractors of the Denver and Rio Grande Railroad company to slaughter whole forests of timber growing on the mountain sides between Del Norte and Wagon Wheel Gap, for railroad tie purposes, leaving thousands of acres of land covered with tree tops and smaller timber ruthlessly destroyed to give room for labor, roads, etc., which will prove highly combustible material. At some time in the future we confidently expect it will be set on fire, when every living thing on the mountain sides, for many miles, will be destroyed; thus destroying nature's protection to the natural reservoirs of water for irrigation purposes. It seems utterly futile, child's play, to post notices warning people of the penalties for failure to extinguish camp-fires, when more than a hundred persons are employed, month after month, piling up highly inflammable material, inviting the devouring element.

After a legal investigation of the forestry act, and an effort to ascertain, if possible, what power to appeal to to stop the wholesale destruction of the forests o the country, by request of the Board of Commissioners, on the twenty-fifth of last

A most useful bulletin has been recently issued by the Forestry Division of the U. S. Department of Agriculture. It is entitled a "Report on the Relation of Railroads to Forest Supplies and Forestry; together with appendices on the structure of some timber ties, their behavior, and the cause of their decay in the roadbed; on wood preservation; on metal ties; and on the use of spark arresters."

The following letter of transmittal accompanies the report:

"U. S. DEPARTMENT OF AGRICULTURE,
FORESTRY DIVISION,
WASHINGTON, D. C., July 12, 1887.

DEAR SIR:

In transmitting to you a copy of the Special Report on the Relation of Railroads to Forest Supplies, allow me to urge upon you both as a citizen and as a wise railroad manager the duty of husbanding the supplies of the country in view of future requirements.

The report not only shows to what extent the railroads of the country are dependent on our waning forest supplies, but also abounds in suggestive thoughts and practical *data* bearing upon a desirable economy in the use of these supplies.

While the country at large must be interested in this subject, on account of the important bearing which the forests have on climatic and agricultural conditions, it is hoped that those in charge of railroad management and railroad building will give particular consideration to the statements herein published and welcome the practical aid contained in the special reports.

Respectfully,

NORMAN J. COLMAN,
Commissioner of Agriculture."

July, I addressed a lengthy communication to United States Attorney Henry W. Hobson, of Denver, detailing the work of destruction in our county, and the effect which such destruction would surely have upon the snow banks which now form our natural reservoirs for our water supply for irrigation. I also stated: "There seems to be no State law upon which an official can base any action. This appeal is therefore made to you, hoping that the general government has delegated powers to some of its officers to examine into this trespass upon the public domain, and protect the people from this wholesale destruction of its forests, etc." This communication resulted in a conference between the Board and Mr. Hobson, during the term of court held in Del Norte, in which Mr. H. stated that owing to a lack of appropriation by the Government for his department, he was unable to pay deputy marshals to make necessary investigation; consequently our effort was in vain.

* * * * * * * * *

Perhaps I am not fully informed as to the Government's policy, but if only a nominal penalty is imposed upon timber depredators, it seems hopeless to check the destruction of the forests when timber and lumber is of such value as to enable the depredators to pay their fines and make money in their business

There should be a reservation of all timber lands at high altitudes; the timber to be cut only on permit from the Forest Commissioner or Deputy Marshal, and making it a penal offense to remove timber without such permit.

I will give a few extracts from the report:

The following reports, written mostly by experts, form a more or less exhaustive account of what the railroads of our country have done or are doing to deplete our forests, and show how the wastefulness in the use of material, which is in danger of great diminution, if not exhaustion, may be checked to some extent, by increasing its durability through the employment of preserving processes; by substituting, where admissible on financial grounds, other material; by observing conditions in its use hitherto largely overlooked; and, lastly, by insuring a continuance of supply through active forestry work on the part of railroad companies and in other ways.

Considering the wasteful manner of getting out railroad timber, it can be fairly estimated that to build our present railroad system more than one hundred million acres, or one-fifth of our present forest area, were stripped during the last fifty years, and the next fifty years will very likely call for more than double the amount, judging from the accelerated development which is probable, and the requirements for renewal.

While railroads have done much for the growth and development of our country, they are also responsible for much of the hinderance to reform in the use of our forest resources. The rapid extension of our railroad system has brought within reach of markets distant forest areas, where, to make lumbering profitable in the absence of home consumption for the inferior grades of material and leavings, wasteful and destructive methods of utilization have to be employed

While, therefore, directly and indirectly, railroad enterprises have contributed largely to a considerable reduction (if not destruction) of forest supplies, it might be presumed that, depending as they do on these supplies, and being by their own continuous character most deeply concerned in their continuation, the railway companies would feel a special interest in forest preservation.

With this view the following reports have been prepared as aids to a proper appreciation of our wood material and its economical use.

* * * * * * * * *

That the allowance here made for the waste of the forests in preparing ties or other timber for market is fully warranted, and the waste often much larger, may be seen from the following extract from a trustworthy lumber journal:

"There is no branch of the lumber industries where there is more waste of raw material than in making ties. Each tie is split from clear wood and it takes about thirty-five feet of clear lumber to make a merchantable tie. Redwood will average about fifty per centnm of clear and suitable wood for ties. When to this is added the percentage of 'culls' that are arbitrarily rejected by the inspectors

on behalf of the railroad at the owner's expense, it will be found that each tie represents about seventy-five feet of good merchantable lumber in the standing timber destroyed for it. Placing the market price of the Redwood lumber at $25 per thousand feet, each tie represents $1.87½ worth of lumber. In the light of these figures it conclusively appears that the present ruling rate of Redwood railroad ties (35 cents) is grossly inadequate. The remedy lies with the owners of the lands from which the ties are cut. If they will combine and agree that they will no longer sacrifice their timber and their work as they have been doing, but will insist upon being paid at least as much approximately as the lumber represented by the ties is worth, they can control the situation. It would be far better for them to sell their lands at a small profit, and get into some more profitable occupation, than to go on for years and at the end find themselves without either timber or money to compensate them for their wasted endeavors. The railroads must have the ties and landowners are foolish if they do not compel the payment of a fair price for them."

* * * * * * * *

Amidst the endless diversity in the location of forests and the prevalence of various kinds of timber, it is impossible to estimate with accuracy the area necessary for the production from year to year of the great amount of timber required by the railways. Estimates, to be worth more than guesses, must be based on established *data*, which, unfortunately, are but few in the forestry practice of the United States.

* * * * * * * *

QUALITY OF TIMBER REQUIRED —The speed and weight of railway traffic demand unconditionally the selection of the best timber. The necessity of imbedding the cross-ties in earth ballast, by which a constant process of decomposition of the woody fibre is induced, requires the most lasting timber. Railway companies use, therefore, the best timber obtainable within a reasonable distance from their lines.

In consequence certain pre-eminently valuable kinds are required in the greatest quantities, and adding to this the general preference given to young and thrifty timber, possessing the greatest toughness and elasticity, it can be readily seen that the time may not be far distant when the wonted supply of those kinds will become exhausted. Many millions of young trees of the white oak tribe are cut annually, each of which make but one tie. When one locality is exhausted, this scene of slaughter of the most valuable young timber is simply shifted to another. The careful selection of the best material makes the waste throughout necessarily large.

* * * * * * * *

ADEQUACY OF SUPPLY.—Railways built through timbered districts encounter little difficulty in procuring the needed supply of construction timber, in the selection of which they have had an almost unlimited choice. The abundance and cheapness of wood has had a great influence in the shaping of the modes of construction in vogue in a country in which for several generations past the inhabitants have been busily engaged in clearing the land of the timber. Are we to wonder at the accounts of proverbial waste in the earlier days of the country, a popular policy simply unavoidable under the circumstances controlling those pioneer periods? But would it be wise to cling to the traditions of the past, refusing to judge impartially the necessities of the future, in which the demands for forest products will be ever on the increase?

The agencies employed in supplying the enormous quantities of ties required by the railway system determine, to a great extent, the amount and price of material offered in the market. In many parts of the country the cutting and hauling of ties to railway stations is performed mostly by the farmers, to whom this labor is a source of ready cash and employment of spare time. Owing to this mode of supply an abundance of material is steadily offered, giving railways full control in the selection of the best quality and the price paid, while by a regulation of the rates of freight they can prevent an undue export to the treeless sections of the country, or check materially the lumber industry of certain localities. In this way prices are kept down, and a show of seeming abundance is maintained which does not in the least prove the supply to be adequate, but merely shows that the great number of people engaged in this industry are willing to haul ties to the railways over distances steadily increasing as the timber nearest the lines is cut off. Immense quantities of the timber is thus cut down and delivered to the railways at prices below its real value. At the time the leading lines west of the Missouri river were constructed, extensive tracts of white oak timber were laid waste in the western States. And the same process is going on throughout the white cedar regions of the north, from which immense quantities of ties are thrown on the lumber market. These channels of supply, based solely on considerations of monetary profit, will continue to bring to the market the forest wealth of many sections of the land, but in many instances, and at a time not far distant, Nature's bountiful supply will be exhausted, and the reckless system of forest clearing will of necessity be a thing of the past. Many parts of the country, once well supplied with valuable timber, have passed through the process of "improvement," but to-day feel quite keenly the loss sustained in former years.

* * * * * * * *

THE NECESSITY OF TIMBER CULTURE.—The satisfactory results of forest tree culture attained by the early settlers of the bleak prairies of the west and north-west have demonstrated beyond a doubt that timber trees, so indispensible to the homestead on the treeless plain, as material for construction, for fencing and for fuel, can be raised by every farmer willing to devote to them, for the few years of their earliest growth, the same care and culture that he is accustomed to give to a crop of corn. Tree culture has become a legitimate branch of agriculture, and is practiced by every intelligent farmer from the shores of the Arkansas river to the north-most prairie of Dakota. Well may it be said that in this instance necessity has been the mother of invention, but it has likewise been the faithful teacher of arboriculture.

Belts and groves planted a few decades ago have already furnished abundant material for house construction and for the more pressing economic wants, lending to the prairie farm a manifest protection from the hardships of an open, treeless country.

With these gratifying evidences of success before the public, the question suggests itself, why should not railway timber be raised as well as wood material needed by the farmer?

* * * * * * * * *

To sum up briefly the results of the agitation in favor of timber culture by railway companies, it can be stated that, while the imperative necessity of such a movement is freely acknowledged by those best informed in regard to the demands of the present and the outlook of the future, little disposition on the part of the railway companies to enter practically into such an enterprise has so far manifested itself. And it is equally clear that so long as a new departure in forest culture is asked or expected from the heads of the operating service, to whom appeals have in greater part been made, no enterprise on a scale even distantly proportioned to the magnitude of the issue can reasonably be expected, and this mainly from the fact that the service must be managed in accordance with conditions existing for the time being and as they will appear on the balance sheet of every corporation. Present expediency and restriction of expenditures outweighs, therefore, all possible advantages of the certain future.

The managers of various leading railways, especially those of the western plains, formerly called the "Great American Desert," have accorded liberal encouragement to tree culture and home forestry, by establishing experimental stations and nurseries in various sections of their lines, designed to show the possibility of tree culture, to attract settlement, and in consequence to promote the sale of lands granted to them by the government. As soon as those objects were successfully accomplished the companies withdrew from this inviting field of

arboriculture, leaving it to the mercy of the settler. It is gratifying that one instance denoting broader views of the necessity of forest culture can be reported—that of the extensive plantation established in Crawford county, Kansas, by Mr. H. H. Hunnewell, of Massachusetts, President of the Kansas City, Fort Scott and Gulf Railway. This far-seeing railway manager and liberal friend of horticulture has caused two sections of prairie land to be planted, in greater part, with the hardy Western Catalpa, one section belonging to the above named corporation, the other his private property. The success attending this timely enterprise, conducted by one of the honored pioneers of American forest culture, Robert Douglas, of Illinois, has so far exceeded the most sanguine expectations that it must be regarded as a landmark in the future development of this great interest.

The trees were cultivated for four successive years, until they had attained sufficient size to fully shade the ground and suppress the growth of weeds. The closeness of their stand is forcing a straight and upward growth with but few lateral branches, which in time will be removed by a natural process.

This brief statement indicates the fundamental requisites of success in timber culture. Proper preparation of the soil, intelligent cultivation of the growing trees until large enough to take care of themselves, and close planting to secure height-growth and straightness of stem, the plan pursued by nature herself in rearing mighty forests. To this is to be added the necessity of selecting the most valuable kind for the object in view.

In the year 1887, I endeavored to obtain statistics relative to the use of native timber by the railway companies doing business in this State. With that object in view, communications were sent to each of such companies requesting certain information from them, as indicated by lists of questions enclosed. The data so obtained was, in a measure, incomplete, and inasmuch as it was fully set forth in my last annual report, it is deemed unnecessary to present it here.

The relations of railways to the forests may be formulated thus:

1. Railway corporations, in the prosecution of their enterprises, require and use immense quantities of timber; and their needs in this respect are likely to increase from year to year.

2. In the absence of adequate laws for the protection of the forests, such corporations use forest supplies wastefully, with no thought of the future. They also frequently create conditions favorable to the widespread destruction of forests by fire.

3. The permanent interests of such corporations, and due regard for the public welfare, demand that the forests be maintained and kept at their maximum producing capacity.

4. Railway corporations should be required by law to use forest products economically—without destructive consequence—and to co-operate in the preservation and extension of forests.

USE OF TIMBER BY TELEGRAPH COMPANIES.—The only information I have obtained with respect to the amount of Colorado timber used by telegraph companies in the State during the years 1887-8, is contained in the following extract from a letter of Mr. J. J. Dickey, Superintendent of the Western Union Telegraph Company:

"We have used during the year 1887, in the State of Colorado, four thousand two hundred and twelve white cedar poles, which we have shipped into the State from Northern Michigan. In addition to this, we have used seven thousand two hundred and thirty native pine poles, purchased within the limits of Colorado."

CHARCOAL MANUFACTURE.—The manufacture of charcoal in this State, mainly for smelting purposes, is carried on in the counties of Chaffee, Dolores, Eagle, Fremont, Lake, La Plata, Park, Summit, and possibly in a few other counties. The heaviest operators are in Chaffee, Fremont, Eagle, Lake and Park counties. The principal consumers of charcoal are the smelting companies of Leadville, Denver and Pueblo. The chief contractors and manufacturers number about thirty. Under them, of course, are a number of smaller opera-

tors. In many of the counties, other than those named above, charcoal is manufactured for local uses.

Circular letters, embracing the following questions, have been sent by me to all the charcoal manufacturers in the State whose addresses could be obtained:

1. Location and number of kilns?
2. Source of timber supply: section____, town____, range____, and whether public land or private?
3. Kinds of timber used, and whether green or dry?
4. Yearly output of coal; where sold, and for what purpose used?
5. Number of kilns in the county, and by whom owned, if known to you?
6. Regulations, if any, needed to prevent the wasteful use, in charcoal burning, of forest growth?

Only about one-third of those to whom such letters were sent made response; and even in such cases the statements given were usually very meagre. As in many other instances involving a large consumption of timber, the responsible parties exhibit a reluctance to furnish information which they fear may be used to their prejudice.

During the last two years I have visited many charcoal camps, in counties where the manufacture has been most extensively carried on, and have gathered such facts relating to the business as was found practicable. Altogether, the conclusions which have been reached by me may be stated as follows:

1. The number of charcoal kilns in the State is about three hundred and fifty; having an aggregate annual capacity of say eight million bushels, or as much as would load sixteen thousand ordinary box cars.

2. The source of timber supply is mainly along the valley of the Upper Arkansas, the lines of the Denver and South Park Railroad in Park county, and Denver and Rio Grande Railroad in Eagle county, and the foothills and lower mountains of the other counties in which

the manufacture of charcoal is conducted. Piñon, both green and dry, and yellow pine in all conditions, are the principal kinds of timber used; and it is taken from both private and public lands, mostly from the latter.

3. The business in this State furnishes employment to about three thousand five hundred persons.

4. Charcoal burners use a large porportion of small or partially grown timber, and are especially destructive to piñon groves and the pine forests. The business may well be regarded as one which, if not materially checked, will result in great public injury.

USE OF PUBLIC TIMBER UNDER THE ACT OF JUNE 3, 1878.—Mineral lands are those which are more valuable for the mineral therein than for agricultural purposes or for the timber thereon.

The right to take timber from mineral lands for building, agricultural, mining or other domestic purposes is provided for under act of Congress approved June 3, 1878, as follows:

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That all citizens of the United States and other persons, *bona fide* residents of the State of Colorado or Nevada, or either of the Territories of New Mexico, Arizona, Utah, Wyoming, Dakota, Idaho or Montana, and all other mineral districts of the United States, shall be, and are hereby, authorized and permitted to fell and remove, for building, agricultural, mining or other domestic purposes, any timber or other trees growing or being on the public lands, said lands being mineral, and not subject to entry under existing laws of the United States, except for mineral entry, in either of said States, Territories or districts of which such citizens or persons may be at the time *bona fide* residents, subject to such rules and regulations as the Secretary of the Interior may prescribe for the protection of the timber and of the undergrowth growing upon such lands, and for other purposes; *Provided*, The provisions of this act shall not extend to railroad corporations.

SEC. 2. That it shall be the duty of the register and the receiver of any local land office in whose district any mineral land may be situated to ascertain from time to time whether any timber is being cut or used upon any such lands, except for the purposes authorized by this act, within their respective land districts; and, if so, they shall immediately notify the Commissioner of the General Land Office of that fact; and all necessary expenses incurred in making such proper examinations shall be paid and allowed such register and receiver in making up their next quarterly accounts.

SEC. 3. Any person or persons who shall violate the provisions of this act, or any rules and regulations in pursuance thereof made by the Secretary of the Interior, shall be deemed guilty of a misdemeanor, and, upon conviction, shall be fined in any sum not exceeding $500, and to which may be added imprisonment for any term not exceeding six months.

In a report of the Committee on Forestry, made to the American Association for the Advancement of Sci-

ence, in 1880, the above mentioned act was characterized as "An act * * granting to the inhabitants of certain regions, where conservation is of the first importance, the unrestrained use of timber upon the public domain, for all mining and domestic purposes, without so much as the pretext of a report as to the amount taken, the least check upon its limit, or the least payment for the privilege;" and declared that such legislation tended to increase rather than diminish the waste of timber.

By the courtesy of the Secretary of the Interior, I am enabled to give a copy of the correspondence, between that officer and the Commissioner of the General Land Office, relative to the right of cutting timber on the public domain, by virtue of the act in question, as follows:

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
WASHINGTON, D. C., October 3, 1887.

HON. L. Q. C. LAMAR,
Secretary of the Interior,

SIR:—I have the honor to acknowledge the receipt—by reference from the Department for report thereon—of a communication from Mr. Samuel B. Berry, dated Washington D. C., September 9, 1887, inclosing a petition by A. C. Dake, *et al.*, of Colorado, for the modification of certain rules and regulations prescribed by this office and approved by the department under date of August 5, 1886, relating to the rights of citizens of the United States and *bona fide* residents of certain States and Territories to procure timber from mineral lands for building, agricultural, mining and other domestic purposes, under the act of June 3, 1878 (20 Stat., 88); also a printed brief presented by Mr. Berry on behalf of said petitioners, and certain exhibits in the shape of photographs and samples of wood and charcoal.

The petition contains three requests, in effect as follows:

First—That the rules and regulations of August 5, 1886, be so modified as to permit the removal from public land of dead timber.

Second—That "Pinon Pine" be excepted in section six of the regulations and placed on the footing of dead timber.

Third—That the rules and regulations be modified so as to permit the cutting of timber from public lands other than those known to be of a strictly mineral character.

In support of said petition, Mr. Berry, in his brief, calls attention to the magnitude of the charcoal industry in the State of Colorado, in connection with which thirty-five hundred (3,500) persons are stated to be directly engaged, three thousand (3,000) of whom are actual laborers earning from three dollars ($3.00) to fifteen dollars ($15.00) per day.

He then proceeds to set forth the great injury it will be to said laborers, and the capitalists engaged in the manufacture of charcoal, operating smelting furnaces and in mining, and more especially to those smelters who use a particular kind of furnace known as the "Water Jacket," if the prayers of the petition are not granted.

He refers to the very liberal rulings of a former Secretary of this Department, and contends that it is not just to change the same, and in so doing destroy the industry that such rulings were instrumental in creating.

Relative to dead timber, he states that it is estimated that there is sufficient burned and dead timber now in Colorado to supply the charcoal kilns in said State for fifty (50) years, and suggests that, in order to provide against the possibility of charcoal men setting fire to the forests for the purpose of deadening more trees with a view to using them for charcoal, that—if the prayer is granted—the Department provide that no timber burned in the next twenty-five years shall be used for any purpose.

He also claims that the burnt timber districts are at an elevation too high for agricultural lands, but that when the timber is removed a wild grass will succeed, suitable for grazing. In this connection he makes the admission that "These lands are not known to be strictly mineral lands. There is probably no mineral in paying quantities there, and the fact that no industry save that of charcoal industry exists is proof conclusive that none other can thrive."

With regard to the "Pifion," or nut Pine tree, he claims it is utterly worthless for any purpose except the manufacture of charcoal, and that it grows on the sides of mountains, among rocks of granite, at a very high elevation, where the land is not susceptible of cultivation after the trees are removed.

I am also in receipt—by reference from the Department—of a letter from Mr. Berry, under date of September 20, 1887, forwarding an affidavit by Governor J. B. Grant, of Colorado, in support of the ground taken in Mr. Berry's brief.

Preliminary to submitting a report on this matter, I deem it proper to call your attention to the fact that the records of this office show that A. C. Dake, of Colorado, the principal petitioner in the case, has cut, or caused to be cut, from *non-mineral* public lands certain pine and spruce trees equivalent to thirty-nine thousand (39,000) cords of wood, for which criminal and civil suits are now pending against him,

as recommended by this office June 14, 1887. The petition is doubtless submitted to obtain a favorable ruling upon the points presented, with the ulterior object in view of disposing of these pending proceedings against A. C. Dake.

It is clear, however, that the case having reached the Court, the same should proceed to adjudication upon its proven merits without intervention through this Department upon the points at issue.

In reference to the requests made, I have to state that I do not agree with the suggestions in favor of the modifications of circular of August 5, 1886. Its provisions are neither in contravention of the intent and purpose of the act of June 3, 1878, nor antagonistic to the interest of settlers or mining or agricultural industries in the States and Territories to which it applies.

As heretofore laid before the Department, in my letter of June 5, 1886, "The act itself is injudicious and entirely too broad, and its repeal or modification has been recommended by you for the reasons that its provisions ignore the importance of the preservation of the timber and invite in a measure great waste and greedy speculation by individuals and corporations. It is impolitic and unjust in not preserving the timber for the use of future settlers and inhabitants, and in permitting it to be taken in large quantities without consideration or proper restrictions. It, however, is still the law, and so long as it remains on the statute book it should be enforced."

The proposed amendments to rule 6 permit the removal from public land of dead timber, and that Piñon Pine be excepted in said section and placed on the footing of dead timber.

No consideration can be accorded to proposals of such a nature, inasmuch as standing timber upon public non-mineral lands, whether burned and scorched or green, and growing timber is a part of the realty, and there is no authority of law for disposing of the same separately from the land.

The proposed modification of rule 2 permits the cutting of timber on certain lands other than those known to be of a strictly mineral character; whereas, the act is particularly explicit in limiting the cutting of timber on "public lands, said lands being mineral, and not "subject to entry under existing laws of the United States, except for "mineral entry."

Yet it is proposed to permit the cutting of timber from "lands "other than those known to be of a strictly mineral character." This, as heretofore held in my said letter, would "be an attempt to make a "law, instead of providing for the enforcement of one already enacted. "The proposed amendment is unauthorized by law and contrary to "good policy."

Moreover, section 2461, U. S. Revised Statutes, provides that timber shall not be procured from the public land with the intent to

"*use*, or employ the same in *any manner whatsoever* other than for "the use of the Navy of the United States," Which has been modified in respect to mineral lands by said act of June 3, 1878; but said act, as above stated, is particularly explicit in limiting the cutting of timber thereunder to lands which are mineral "and not subject to "entry under existing laws of the United States, *except for mineral "entry.*"

And further, not only are the privileges granted in said act confined to such lands, but in all cases in which parties take advantage of the provisions of same, they must stand prepared to establish the mineral character of the tracts depredated upon—the burden of proof in this respect resting upon them. (See decision of Judge Buck in case of W. A Dodge, *et al.*, Lewiston, Idaho, District Court, December term, 1886).

In respect to the propriety of permitting the taking of public timber from mineral lands to be used as charcoal for smelting operations, I am of the opinion that smelting is not one of the purposes for which public timber can be cut within the meaning of the act of June 3, 1878, inasmuch as it is not an adjunct to actual mining operations, standing really in no closer relation thereto than that existing between the operations of a grist-mill and the industry of agriculture. It forms a distinct industry from mining, inimical thereto in its interests in some localities—as shown by the records of this office.

From the records it appears that ordinarily the wood for charcoal is necessarily taken from mineral lands in close proximity to active mining operations; and the immense amount of timber necessary in such operations, where every foot of advance into the earth must be protected by heavy timbers, renders the preservation of public timber of vast importance to miners, who universally recognize the fact that the use of charcoal is *detrimental* to the mining interests. The miners allege that the charcoal burners take everything, large and *small*, and by so doing materially *retard* mining operations—since, except in operations of the largest scale in already developed mines, the use of timber for mining purposes is necessarily slow, while for charcoal the rapidity of its use is only limited by the size of the kilns and the number of men employed, who have only to fell and cut up the trees.

There appears, in fact, to be an open issue on this point between the mining and the smelting interests. The smelters maintaining that they must have charcoal or raise the price of smelting; the miners objecting to the unlimited consumption of public timber by the burners—but being, in a sense, at the mercy of the smelters who represent a skilled industry, they are not prepared to stand the threatened rise in the price of smelting.

Not only does it appear that smelting is a distinct industry from mining, but it is further shown that the smelters are not themselves directly engaged in charcoal burning, but *purchase* the charcoal from those who make a business of burning it—the same being placed upon the market as an article of traffic.

It is shown, moreover, by an official report from Colorado, that the use of charcoal is not absolutely essential in smelting ores, but is only combined with coke as a means of smelting more rapidly with the same fixed expense; and official statements received in respect to Montana, Idaho and Eastern Washington Territory affirm that it is only a question of a short time before wood and charcoal for smelting purposes will give way entirely to coal and coke.

Another report from Colorado states that "Observations based on "considerable travel through the State and investigations of timber "trespasses in different sections of Colorado, point to the fact that "the greatest damage done to the timber interests of the State is "done by the charcoal burners. Wherever one of these industries "has had a location, the mountain sides are bare as if shorn by "machinery, and the charcoal kiln absorbs alike the large and the "small timber. Ostensibly dead timber is used in this industry, but "a convenient fire first deadens the timber and then the charcoal "burner follows."

Not only is the devastation of timber by these burners in the vicinity of mines reported as wholesale, but, as shown above, there is a general disregard for the provisions of law in respect to the class of lands, and also the size of the trees—immature trees which have not attained to the prescribed size of eight inches in diameter being the most desirable for charcoal purposes. Not a stick of even Piñon pine is now to be found in some localities where mines have been but recently developed. This Piñon pine, while represented to be worthless for building purposes, is stated to be the best fuel found in the mountain districts. And the added fact that it represents almost the only timber supply in many such districts renders it of importance that adequate measures should be adopted looking to the preservation of a due proportion of it in the interest of the future settler, and with a view to averting the detrimental results of sudden and unchecked laying bare of mountain sides.

The above, based upon officially reported facts, appears to sufficiently answer the principal points enlarged upon in Mr. Berry's brief and the communication from Governor Grant.

In respect to the plea made in behalf of the large class now engaged in the charcoal industry, both as laborers and capitalists—claiming that to enforce the existing rules and regulations in question would work a hardship to the same—more especially to those smelters who use a particular kind of furnace known as the "water

jacket," I have the honor to direct attention to the fact that the law was not enacted for the purpose of furnishing employment to parties engaged in the production of charcoal, or any other one species of labor, but to enable settlers to procure timber to supply domestic necessities. Nor is it the duty of the government to protect or encourage any particular industry, or, as in this instance prayed, a *patent* of a peculiar kind—but to protect the interests of the public at large. Regulations are not enacted for the benefit of *present* operators, or for any limited space, as proposed of twenty-five (25) years, but the same are for all time and the public in general, with a view to securing the interests of the government, of the settlers and the public at large, which are paramount to the business interests of any one industry growing out of traffic in public timber.

The rapid disappearance of all vestige of trees throughout the mining districts, evidences that proper provisions for the interests in the near future of settlers throughout those regions demands that existing regulations in the matter shall be rigidly enforced, and that yet further regulations shall be enacted prescribing a more economic use of public timber than has heretofore been insisted upon.

Hence, in view of the very cogent reasons that, as shown above, there is no authority of law under which timber can be taken from public lands for smelting purposes, and that such use of public timber is directly detrimental to those interests in whose behalf there is such provision made by law it is evident that the further use of public timber for smelting purposes should be prohibited.

It is also equally important that the practice of putting public timber on the market in the shape of charcoal should be likewise prohibited.

I return herewith the referred papers and exhibits with the exception of the duplicate of the petition and brief which is retained upon the files of this office.

Very respectfully,

(Signed) WM. A. J. SPARKS,
Commissioner.

DEPARTMENT OF THE INTERIOR,
WASHINGTON, October 11, 1887.

A. C. DRAKE, *et al.* { *Petition for Change of Circular Instructions.*

To the Commissioner of the General Land Office:

SIR—Your report, dated October third instant, upon the petition of A. C. Drake, Joseph A. Lamping, H. D. McAllister and H. H. Millen, praying an amendment to Circular approved August 5, 1886, (5 L. D., 129,) relative to cutting timber on the public domain, as provided by the act of June 3, 1878, (20 Stat., 33,) has been considered.

I fully concur in your recommendation relative thereto, that the proposed amendments will not be in accordance with the statute upon the subject; and do not deem it necessary to add anything to what you have said in the matter.

The petition is dismissed, and together with accompanying papers and exhibits, is herewith transmitted for the files of your office.

You will advise petitioners of this action.

Very respectfully,

(Signed) H. L. MULDROW,
Acting Secretary.

SMELTING OF ORES.—In the month of October, 1887, circular letters were sent to the various smelting and reduction companies in the State, inquiring as to the amount of charcoal used by them; where the coal was manufactured; what, if anything, the use of coke or other substitutes for charcoal would add to the cost of reducing ores; and what measures, if any, could be adopted to prevent the wasteful use of timber in charcoal manufacture.

Of the thirty or more establishments in the State to whom letters were sent, about one-half only made reply. It appeared that some of the works were not then running, and that others had adopted processes which did not require the use of charcoal. Three smelters at Leadville reported their annual consumption of charcoal, respectively, at three hundred thousand, eight hundred and sixty-four thousand, and one million two hundred thousand bushels. One at Rico placed its annual consumption at twenty-five thousand to forty thousand bushels. The returns as a whole were not sufficiently complete to afford a basis for computation of the aggregate yearly consumption. Statements concerning the points of largest manufacture and consumption of charcoal accorded with information had from the charcoal manufacturers, as given on a preceding page of this report. Smelting companies making use of charcoal, estimated that to substitute coke or other fuel for charcoal

would increase the cost of ore reduction from fifteen to twenty-five per cent. But few expressions of opinion were had as to proper measures to be adopted to prevent the wasteful use of forest growth in charcoal manufacture. Suggestions were made that a very careful governmental supervision be exercised over manufacturers, and that they be confined strictly to the use of dead timber.

During that year I consulted with the managers of some of the smelting companies using charcoal, with a view of devising means whereby the consumption of the product might be lessened. It then appeared that the great proportionate cost of coke and mineral coal—in part owing to high freight rates, had obliged the smelting companies to rely mainly upon charcoal, which could be obtained at much less cost than the other kinds of fuel. In view, however, of the then recent extensive development of coal and coke interests in western Colorado, and their railway connections with Leadville and other smelting points, it was believed that coke and mineral coal would soon be obtainable at prices which would justify its larger use in smelting.

The hopeful views then entertained with respect to a decrease in the manufacture and use of charcoal were not, I regret to say, well founded, for the business has since grown to still larger proportions.

MINING OPERATIONS.—In a State of such wide extent as Colorndo, where gold, silver and coal mining are leading industries, the demand for mining timber, lumber for construction, fuel for steam and heating purposes, etc., must necessarily be large. The manufacture of charcoal for smelting uses is also a concomitant of the mining industry.

Both the general and State governments have sought to foster the mining interests of this region, and in so

doing may not have had due regard for the preservation of the forests. The general act (of June 3, 1878,) permitting miners and others to fell and remove for building, agricultural, mining or other domestic uses, timber growing on the public mineral lands, although beneficent in its intentions, has been productive of great harm to the public forests. The privileges so granted have, in numerous instances, been grossly abused. In many of the older mining districts, the timber, never too abundant, has been wholly consumed; the streams, deprived of all forest protection, have become nearly or quite extinct, and the face of the country left bare and desolate. In addition to these evils, mine owners and others, in some districts, are now obliged to import, at heavy expense, timber for all necessary purposes. Under a proper system of forest management the forests would be maintained and timber production made continuous.

Mining operations, as now conducted, are specially destructive to the forests. Young, or half-grown trees, being of convenient size, are largely used for timbering mines. As a rule, no growing trees in the vicinity of mines long escape the ax.

MANUFACTURE OF LUMBER.—At the close of the year 1887 about one hundred and fifteen saw-mills, or lumber manufacturing establishments, were in operation in this State. As reported to me, they were divided among the several counties as follows:

Archuleta, 2; Boulder, 6; Chaffee, 1; Clear Creek, 6; Conejos, 3; Costilla, 1; Custer, 2; Delta, 1; Dolores, 1; Douglas, 2; El Paso, 10; Fremont, 2; Garfield, 3; Gilpin, 1; Grand, 6; Gunnison, 3; Hinsdale, 2; Jefferson, 2; Lake, 5; La Plata, 8; Las Animas, 2; Montrose, 3; Ouray, 3; Park, 5; Pitkin, 2; Rio Grande, 2; Routt, 2; Saguache, 2; San Juan, 2; San Miguel, 5; Summit, 7.

The foregoing makes a total of one hundred and two, which has probably been largely increased during the

past year. The list does not embrace the counties of Eagle, Huerfano, Larimer, Mesa or Pueblo, which presumably contain from fifteen to twenty additional mills. Their number has not been reported to me. Several lumber firms located in Denver have mills in other parts of the State.

For the purpose of collecting information relating to the lumber business of the State, circular letters were sent to about one hundred of the mill owners, whose post-office addresses had been obtained. The following questions were asked in that connection:

1. What is your principal source of timber supply?
2. What kinds of timber are used by you?
3. What is the estimated annual product of your mill?
4. What proportion of native to foreign lumber is used in your locality?
5. What legisiation, if any, is needed to insure the better preservation and more economical use of forest growth?

Answers to the foregoing were made by forty-six firms. Accepting as true the statements made by them, the following facts appear:

1. In a large majority of cases the principal source of timber supply is given as "the neighboring mountains;" three firms give the source of supply as "mineral lands;" two report it as "patented lands;" two, "mineral and patented lands;" two, "from settlers;" and three, from "public lands." Others do not state the source of supply.

2. Yellow and white pine, and white and red spruce, are the kinds of timber most commonly used in lumber manufacture. The use of yellow pine is probably greater than that of any other kind; the spruces are used more at high altitudes. Several correspondents stated that they were using all of the kinds named above; one, that

he was using pine, spruce and fir; and another that he was using spruce and *hemlock* (?)

3. The estimated aggregate annual lumber product of forty-five establishments is given at thirty-nine million five hundred thousand feet; three firms, in addition to their lumber manufacture, report an aggregate annual product of three million one hundred thousand shingles.

4. The proportion of native to foreign lumber used in those portions of the State embraced in this inquiry is, approximately, ninety per cent. native to ten per cent. foreign. This inquiry, of course does not embrace the plains region.

6. Of thirty correspondents who write upon the subject of forest legislation, twelve urge the prevention of forest fires; six recommend the adoption of a stumpage law, or some regulation by which timber could be sold under a royalty, or by the acre, or by the thousand feet; four urge the more efficient protection of young trees; two, the more rigid enforcement of the present laws; two, the prevention, or regulation, of tie-chopping; one, the encouragement of forest tree planting; one, the fixing of maximum railroad freight rates on coal, coke, etc., to diminish the use of wood fuel for smelting and mining purposes; and two advise the non-exportation of timber.

One writer states that much damage to timber is occasioned in his locality (San Juan county) by snow-slides.

Conservative Agencies.

ACTION OF THE FEDERAL GOVERNMENT*.

TIMBER RESERVATIONS.—Reservations of timber fit for ship building were common in the patents granted for land in the colonial period. In 1794, under an act passed for the establishment of a navy, provision was made for the building of six vessels of war, and the agents entrusted with that duty recommended the use of live oak in the construction of the ships. The importance of securing a sufficient supply of timber for the Navy was then and upon other occasions strongly urged, and finally, in 1799, Congress appropriated $200,000 for the purchase of growing or other timber, or of lands on which timber was growing suitable for the Navy, and for its preservation for future use. Florida and Louisiana, extending along the entire Gulf coast and including most of the live oak known to exist, then belonged to foreign powers, and the amount of that timber within the Union, as then bounded, was very limited.

Small purchases of timber lands were made under the act of 1799, on the Georgia coast, but nothing of importance was done until 1817. In that year an act was passed directing the reservation of such public lands having a growth of live oak or cedar timber suitable for the Navy, as might be selected by the President.

The acquisition of Florida brought into the United States extensive groves of live oak, but these lands were so often encumbered by claims under former governments that the first examinations for lands with clear titles met with poor success.

Under the act of 1817, surveyors were appointed, and upon their reports reservation was made of Commission-

*Compiled from official sources.

ers, Cypress and Six Islands in Louisiana, containing about nineteen thousand acres, and, as was supposed, about thirty-seven thousand live oak trees fit for Naval use, but some of them difficult of access.

In 1827 the Secretary of the Navy made the following recommendations:

1. The purchase of heavily timbered lands.
2. The reservation of sufficient lands in Florida and Louisiana, after proper surveys.
3. The planting of trees upon land already owned by the Government, or that what might be bought, including Grover Island; and
4. The purchase and storage of large quantities of timber, which might be kept half a century, if need be, with proper shelter.

In the same year (1827), by act of Congress, the President was authorized to take proper measures to preserve the live oak timber growing on the lands of the United States, and he was authorized to reserve such lands in sufficient quantities to render the same valuable for Naval purposes; and by a subsequent act provision was made for the punishment, by fine and imprisonment, of persons found guilty of cutting or destroying any live oak, red cedar or other tree growing on any lands of the United States.

In 1828 the sum of $10,000 was granted for the purchase of lands for the supply of live oak and other timber for the Navy, and about three thousand six hundred and fifty arpents were bought on Santa Rosa Sound; and during two or three succeeding years a system of cultivation was undertaken.

Under the different acts passed between the year 1817 and 1858 some two hunnred and forty-four thousand acres of timber lands along the southern coast were reserved from sale. Limited reservations for public parks, military posts and for use of the Indians have been made in recent years, which, taken together, em-

brace a considerable amount of timbered lands. The reservation in Montana and Wyoming for the Yellowstone Park is a notable instance of right action on the part of the general government.

LAWS RELATIVE TO THE PRESERVATION OF GOVERNMENT TIMBER.

a. LIVE OAK, RED CEDAR AND OTHER TIMBER.

[Revised Statutes of the United States.]

SEC. 2460. The President is authorized to employ so much of the land and naval forces of the United States as may be necessary effectually to prevent the felling, cutting down, or other destruction of the timber of the United States, in Florida, and to prevent the transportation or carrying away any such timber as may be already felled or cut down; and to take such other and further measures as may be deemed advisable for the preservation of the timber of the United States, in Florida.

SEC. 2461. If any person shall cut, or cause or procure to be cut, or aid, assist, or be employed in cutting, or shall wantonly destroy, or cause or procure to be wantonly destroyed, or aid, assist, or be employed in wantonly destroying any live oak or red cedar trees or other timber standing, growing, or being on any lands of the United States which in pursuance of any law passed, or hereafter to be passed, have been reserved or purchased for the use of the United States, for supplying or furnishing therefrom timber for the Navy of the United States; or if any person shall remove, or cause, or procure to be removed, or aid, or assist, or be employed in removing from any such lands which have been reserved or purchased, any live oak or red cedar trees, or other timber, unless duly authorized so to do, by order, in writing, of a competent officer, and for the use of the Navy of the United States; or if any person shall cut, or cause or procure to be cut, or aid, or assist, or be employed in cutting any live oak or red cedar trees, or other timber on, or shall remove, or cause or procure to be removed, or aid or assist, or be employed in removing any live oak or red cedar trees or other timber, from any other lands of the United States, acquired, or hereafter to be acquired, with intent to export, dispose of, use, or employ the same in any manner whatsoever, other than for the use of the Navy of the United States, every such person shall pay a fine not loss than triple the value of the trees or timber so cut, destroyed, or removed, and shall be imprisoned not exceeding twelve months. (See 4751).

SEC. 2462. If the master, owner, or consignee of any vessel shall knowingly take on board any timber cut on lands which have been

reserved or purchased as in the preceding section prescribed, without proper authority, and for the use of the Navy of the United States; or shall take on board any live oak or red cedar timber cut on any other lands of the United States, with intent to transport the same to any port or place within the United States; or to export the same to any foreign country, the vessel on board of which the same shall be taken, transported or seized, shall, with her tackle, apparel, and furniture, be wholly forfeited to the United States, and the captain or master of such vessel wherein the same was exported to any foreign country against the provisions of this section, shall forfeit and pay to the United States a sum not exceeding one thousand dollars. (See 4751).

SEC. 2463. It shall be the duty of all collectors of the customs within the States of Alabama, Mississippi, Louisiana, and Florida, before allowing a clearance to any vessel laden in whole or in part with live oak timber, to ascertain satisfactorily that such timber was cut from private lands, or, if from public ones, by consent of the Navy Department. And it is also made the duty of all officers of the customs, and of the land officers within those States to cause prosecutions to be seasonably instituted against all persons known to be guilty of depredations on, or injuries to, the live oak growing on public lands. (See 4205, 4751).

SEC. 4205. Collectors of the collection districts within the States of Florida, Alabama, Mississippi, and Louisiana, before allowing a clearance to any vessel laden in whole or in part with live oak timber, shall ascertain satisfactorily that such timber was cut from private lands, or, if from public lands, by consent of the Department of the Navy. (See 2463).

SEC. 4751. All penalties and forfeitures incurred under the provisions of sections twenty-four hundred and sixty-three, Title "The Public Lands," shall be sued for, recovered, distributed and accounted for, under the directions of the Secretary of the Navy, and shall be paid over, one-half to the informers, if any, or captors, where seized, and the other half to the Secretary of the Navy for the use of the Navy pension fund; and the Secretary is authorized to mitigate, in whole or in part, on such terms and conditions as he deems proper, by an order in writing, any fine, penalty or forfeiture so incurred.*

*This law was originally designed for the protection of the resources of live oak and red cedar along the Gulf coast, and its application had been extended to "other timber" by various rulings of the Department of the Interior and judicial decisions, which it is not here necessary to repeat.

See *Ex. Doc.* (Senate) *No. 9*, Second Session Forty-third Congress, parts 1 and 2, in which ample details are given as to the earlier measures taken for the prevention of timber depredations, as well as those adopted down to the beginning of 1878 under the system begun in May, 1877.

b. DEPREDATIONS ON TIMBER LANDS.

SEC. 5388. Every person who unlawfully cuts, or aids, or is employed in unlawfully cutting, or wantonly destroys, or procures to be wantonly destroyed, any timber standing upon lands of the United States which in pursuance of law may be reserved or purchased for military or other purposes, shall pay a fine of not more than $500 and be imprisoned not more than twelve months. (See 2460-2463).

c. PROTECTION OF ORNAMENTAL AND OTHER TREES ON GOVERNMENT RESERVATIONS.

[Chapter 151, Supplement to the Revised Statutes]

Be it enacted, etc. * * *

SECTION 1. That if any person or persons shall knowingly and unlawfully cut, or shall knowingly aid, assist or be employed in unlawfully cutting, or shall wantonly destroy or injure, or procure to be wantonly destroyed or injured, any timber-tree or any shade or ornamental tree, or any other kind of tree, standing, growing or being upon any land of the United States, which, in pursuance of law, have been reserved, or which have been purchased by the United States for any public use, every such person or persons so offending, on conviction thereof before any Circuit or District court of the United States, shall, for every such offense, pay a fine not exceeding $500, or shall be imprisoned not exceeding twelve months.

SEC. 2. That if any person or persons shall knowingly and unlawfully break, open, or destroy any gate, fence, hedge, or wall inclosing any lands of the United States, which have, in pursuance of any law, been reserved or purchased by the United States for any public use, every such person so offending, on conviction, shall for every such offense, pay a fine not exceeding $200, or be imprisoned not exceeding six months.

SEC. 3. That if any person or persons shall knowingly and unlawfully break, open or destroy any gate, fence, hedge, or wall inclosing any lands of the United States, reserved or purchased as aforesaid, and shall drive any cattle, horses or hogs upon the lands aforesaid for the purpose of destroying the grass or trees on the said grounds, or where they may destroy the said grass or trees, or if any such person or persons shall knowingly permit his or their cattle, horses or hogs to enter through any of said inclosures upon the lands of the United States aforesaid where the said cattle, horses or hogs may or can destroy the grass or trees or other property of the United States on the said land, every such person or persons so offending, on conviction, shall pay a fine not exceeding $500, or be imprisoned not exceeding twelve months; *Provided*, That nothing in this act shall be construed to apply to unsurveyed public lands and to public lands subject to preemption and homestead laws; or to public lands subject to an act to

promote the development of the mining resources of the United States, approved May 10, 1872. (March 3, 1875).

d. USE OF WOOD AND TIMBER IN UNSURVEYED PARTS OF THE TERRITORIES.

An act of April 30, 1878, after appropriating $7,500 for actual expenses of clerks detailed to investigate fraudulent entries, trespasses on the public lands and official misconduct, continues as follows:

Provided, That where wood and timber lands in the Territories of the United States are not surveyed and offered for sale in proper subdivisions, convenient of access, no money herein appropriated shall be used to collect any charge for wood or timber cut on the public lands in the Territories of the United States for the use of actual settlers in the Territories, and not for export from the Territories of the United States where the timber grew; *And, provided further*, That if any timber cut on the public lands shall be exported from the Territories of the United States, it shall be liable to seizure by the United States authorities wherever found.

SUPERVISION OF OFFICERS OF THE TREASURY AND INTERIOR DEPARTMENTS.—For some years previous to 1854, there was in existence a system of timber agencies under instruction from the Solicitor of the Treasury. In 1854 these agencies were discontinued and supervision was transferred to the General Land Office, in the Department of the Interior. In the year following a circular was issued, which remained the basis of regulation until 1877. Under this the officers of the several land offices were directed, whenever reliable information reached them that spoliations of public timber were being committed, to investigate the matter, and to seize all timber found to have been cut, without authority, on the public lands, to sell the same, by public auction, to the highest bidder, and deposit the proceeds in the Treasury. They were to bring the offense committed to the attention of the proper officers, that the perpetrators might be arrested and held to answer, as usual in criminal cases.

INSUFFICIENCY OF EARLY PROTECTIVE MEASURES.—It is clear that these early protective measures were ineffectual when we find it stated from official sources that the total net revenue to the Government, from the many millions of dollars worth of timber taken, amounted, from the beginning of records down to January, 1877, to but $154,373.74. The figures are not at hand showing the revenue from that source since the date here given. It is likely, however, that the proportion of losses to recoveries has not, during the last decade, varied greatly from the above.

SPECIAL AGENTS OF THE GENERAL LAND OFFICE.—In May, 1877, a change was made in the management of the public timber lands. The duties formerly assigned to Registers and Receivers in the land offices, in the care of timber, were assumed by the General Land Office, and clerks from that office were detailed to investigate and report upon cases of depredation, with the view of prosecuting offenders, as the law provides.

This system prevailed for a time, but finally gave way to one, still in force, in which the persons appointed to prevent timber depredations upon Government lands, and to protect the public timber from waste and destruction, are officially designated as "Special Timber Agents."

OBJECT OF PROTECTING THE PUBLIC TIMBER.—In a printed circular of instructions to Special Agents of the General Land Office, issued June 1, 1883, the object of protecting the timber upon Government lands is stated as follows:

> The object of the Government in endeavoring to prevent the waste and destruction of public timber is, primarily, to preserve it for the wants of future generations—having, of course, due regard for the requirements of the present. The result of the destruction of the forests in permitting a more rapid melting of the snows in spring than would occur in the same region if well sheltered, and in decreasing

the capacity of the soil to retain moisture after rains—in both cases increasing the liability to sudden and devastating floods, not only in the denuded sections, but sometimes hundreds of miles distant; also the well established climatic influence of such destruction in diminishing the annual rain-fall, to the serious detriment of regions already subject to frequent droughts, and other reasons which, render the preservation of the public timber, a matter of vital importance not only to the agricultural but to many other extensive interests.

The following extracts are taken from the annual report for the year 1886, of the Commissioner of the General Land Office:

The rapid and unfortunate progress made in the extinction of the native forests of the country has repeatedly been brought to the attention of Congress by this office. In my annual report for 1885, it is said: The importance and necessity of preserving our remaining forests and woodlands is urged upon the attention of legislators and the public by thoughtful persons, scientific bodies and patriotic associations throughout the country. It is declared that the extinction of forests may be expected to seriously affect the growth of population and reduce the cultivable area of the soil; that forests absorb moisture, and that the retention of timber and undergrowth on mountain sides is necessary to hold the snows and prevent their rapid melting, as also the precipitation of rain-fall in floods upon the valleys below; that the loss of forests at the heads of streams of water "means the ruin of great rivers for navigation and irrigation, the destruction of cities located along their banks, and the spoliation of broad areas of the richest agricultural land;" that forests once destroyed can be renewed only at enormous cost, and that when destroyed no subsequent precaution or expenditure will be able to prevent or evade the widespread calamity that must follow.

The subject is one of unquestionable importance, and I respectfully renew the recommendations heretofore made, and urge early legislative action looking to the preservation of the rapidly disappearing forests on public lands.

EXTRACTS FROM RULES AND REGULATIONS OF THE SECRETARY OF THE INTERIOR, AND FROM JUDICIAL OPINIONS AND DECISIONS.

a. LANDS COVERED BY HOMESTEAD OR PRE-EMPTION ENTRY.

Homestead or pre-emption claimants who have made *bona fide* settlements upon public land, and who are living upon, cultivating, and improving the same in accordance with law, and the rules and

regulations of this Department, with the intention of acquiring title thereto, are permitted to cut and remove, or cause to be cut and removed, from the portion thereof to be cleared for cultivation, so much timber as is actually necessary for that purpose or for buildings, fences and other improvements on the land entered.

In clearing for cultivation, should there be a surplus of timber over what is needed for the purposes above specified, the entryman may sell or dispose of such surplus; but it is not allowable to denude the land of its timber for the purpose of sale or speculation before the title has been conveyed to him by a patent.

* * * * * * * * *

The abandonment of a settlement claim after the timber has been removed is presumptive evidence that the claim was made for the primary purpose of obtaining the timber. * * * Squatters upon public lands have no right to cut timber therefrom for any purpose.

Judge Nelson, in the case of the United States *vs.* McEntee, in the United States District Court, Minnesota, October term, 1877, held as follows, McEntee being a settler under the homestead law:

The lands can be cleared and timber sold if cut down for the purpose of cultivation, but if the sale and traffic is the only reason for severing the timber, and it is not done with a view of improving the land, the intentions of the lawgiver are subverted.

In the case of the United States *vs.* James A. Smith, at the April term, 1882, of the United States District Court for the Eastern District of Arkansas, where it was charged that said Smith unlawfully cut and removed certain timber from lands belonging to the United States, in the State of Arkansas, and converted the same into cordwood and railroad ties, and where evidence was produced to show that he purchased said timber from parties who claimed to own the land upon which it stood, Judge Caldwell held as follows:

Persons cutting and removing timber from lands are bound to know that they who assumed to sell them the timber had the right to do so, and if they did not, the purchaser is liable to the lawful owner of the timber for its value, and if the trees are worked up into cordwood or railroad ties, such cordwood and ties are the property of the owner of the land as much as the trees were, and the owner of the land is entitled to recover the value of the timber in its new form, in other words, the value of the cordwood and railroad ties.

b. MINERAL LANDS—ACT OF JUNE 3, 1878.

* * * * * * * * *

Timber felled or removed shall be strictly limited to building, agricultural, mining and other domestic purposes, within the State or Territory where it grew. All cutting of such timber for use outside of the State or Territory where the same is cut, and all removals thereof outside of the State or Territory where it is cut, are forbidden.

No person will be permitted to fell or remove any growing trees of any kind whatsoever, less than eight inches in diameter.*

Persons felling or removing timber from public mineral lands of the United States, must utilize all of each tree cut that can be profitably used, and must cut and remove the tops and brush, or dispose of the same in such manner as to prevent the spread of forest fires.

* * * * * * * * *

Locators of mining claims, so long as they comply with the law governing their possessions, are invested by Congress with the exclusive right of possession and enjoyment of all the surface included within the lines of their locations. If a locator neglects to protect himself and his possessions, the law does not assume that the United States is injured by the cutting and use of the timber on such claim. It is the duty of the possessor to care for his own if trespass be attempted by a stranger; he alone is concerned for its protection, and may unnoubtedly maintain suit to that end.

c. RIGHT OF RAILROAD COMPANIES TO THE USE OF PUBLIC TIMBER.

No public timber or material is permitted to be taken or used for the *repair or improvement* of a road after its original completion. The right to take such timber or material ceases when the road is open to the public for general use.

NOTE.—See exception to the above, in the case of the Denver and Rio Grande Railroad.

Timber or material may be taken from the public lands only for the construction of the *road*, including roadway, bridges, culverts, trestle and the like, but can not be taken for the erection of stations, freight houses, fences, sheds, or other buildings or structures.

No public timber is permitted to be taken or used for fuel by any railroad company.

No railroad company is entitled to procure, or cut, or remove, or cause to be procured, or cut, or removed, either by itself or through its agents, or other persons, in any manner, any timber or other material from the public lands, for *sale or disposal* either to *other companies* or to the *public*, or for *exportation*.

The right of railroad companies to take timber and other material from the public lands is restricted by law to lands "adjacent to the line of road." This will be construed as meaning that the companies have permission to take timber and other material along the line of the road in progress of construction, and in the immediate vicinity thereof or in near proximity thereto. It will not be deemed a license to go to distant points and obtain timber to the deprivation of settlement, mining and other rights and interests in such localities, and the impairment of the general welfare of the country over

*Black, or "lodge-pole," Pine, growing in separate bodies upon mineral lands, is excepted from this rule.

extended areas. The privilege must be exercised where the law places its exercise, viz: "adjacent to the line of the road."

* * * * * * * * *

No person is authorized to take timber from the public lands for the purpose of *selling* the same to railroad companies.

Only those persons who are the direct or duly authorized agents of a proper railroad company, are permitted to obtain timber or other material for the use of such company in the construction of its road.

Unauthorized persons cutting and taking timber from the public lands, although for sale to a railroad company, will be deemed trespassers, and they, as well as the company receiving or purchasing the same, will be proceeded against accordingly.

No growing trees less than eight inches in diameter will be permitted to be cut. No tree can be cut that is not required for use for construction purposes, and all of each tree cut that can be used for construction purposes must be utilized.

The tops and lops of all trees must be cut and piled, and the brush removed or disposed of in such a manner as to prevent the spread of forest fires.

* * * * * * * * *

The right of any railroad company to cut timber for construction purposes, under the acts of March 3, 1875, ceases at the expiration of five years after its definite location, upon any portion of said road which is not then completed.

MEASURES FOR THE PREVENTION OF FOREST FIRES, ETC.—The following notice relative to forest fires is furnished to special timber agents, printed on cloth, for posting in conspicuous places in their districts:

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
WASHINGTON, D. C, March 8, 1883.

The attention of the public is called to the fact that large quantities of public timber are annually destroyed by forest fires, which, in many cases, originate through the carelessness of hunting, prospecting and other camping parties, while in some instances they occur through design.

I take this method of warning all persons that hereafter the cause and origin of all fires will be closely investigated, and where the fire is ascertained to have originated through either carelessness or design, the parties implicated will be prosecuted to the full extent of the law.

Special timber agents are hereby directed to proceed against all offenders under the local laws of the State or Territory relating to the unlawful setting out of fires in which the same may occur.

The public generally are requested to aid the officers of the Government in its efforts to check the evil referred to, and the punishment of all offenders.

N. C. McFARLAND,
Commissioner.

Special timber agents are instructed to protect the public timber from waste and destruction, from any and all sources; and to that end—when there are State or Territorial laws for the preservation of timber—such agents are authorized and directed to co-operate with the State or Territorial authorities, and to aid and assist in enforcing said laws.

And should a special timber agent at any time receive information of a forest fire being in progress on the public lands within his district, it is made his duty to proceed to the locality, and render such aid and assistance in checking and extinguishing the fire as he might be able to; and after it is under control, to use his best endeavors to ascertain its origin, and to assist in the apprehension and punishment of offenders, if any.

A failure on the part of woodmen to utilize all of the tree that can possibly be used, and to take reasonable precaution to prevent the spread of fires, is regarded as wanton waste, and subjects the offending parties to prosecution for waste and destruction of public timber.

CLASSIFICATION OF MESQUIT AS TIMBER.—In a circular from the Department of the Interior, of date October 12, 1882, "Mesquit" is classified as timber, and its cutting and removal made subject to the same restrictions that apply to other kinds of timber growing on the public lands.

MEASURE OF DAMAGES TO WHICH THE GOVERNMENT IS ENTITLED FOR TIMBER TRESPASS.—The following circular relative to the manner of ascertaining the damages to which the Government is entitled

under the several cases set forth, is based upon the decision of the United States Supreme Court, at its October term, 1882, in the case of Wooden-ware Company *vs.* The United States (106 U. S., 432):

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
WASHINGTON, D. C., March 1, 1883.

Special Timber Agents, General Land Office:

GENTLEMEN—Respecting the measure of damages to which the government is entitled in settlement for timber trespass upon the public domain, the United States Supreme Court has recently decided that:

1. When the trespasser is a knowing and willful one, the full value of the property at the time and place of demand, with no deduction for labor and expense of defendant, is the proper rule of damages.

2. Where the trespasser is an unintentional or mistaken one, or an innocent purchaser from such a trespasser, the value of the timber at the time when first taken by the trespasser, or, if it has been converted into other material, its then value, less what the labor and expense of the trespasser and his vender have added to its value, is the proper rule of damages.

3. Where a person or corporation is a purchaser without notice of wrong from a willful trespasser, the value at the time of purchase should be the measure of damages.

You will, therefore, in cases where settlement is contemplated, state the facts and circumstances attending the cutting and the purchase of the timber, in such clear and definite manner that the Supreme Court decision, above referred to, can be readily applied.

In cases where settlement with an innocent purchaser of timber cut unintentionally, through inadvertence or mistake, is contemplated, you are instructed to report, as nearly as possible, the damage to the government as measured by the value of the timber before cutting.

Very respectfully,

N. C. McFARLAND,
Commissioner.

Approved:

DEPARTMENT OF THE INTERIOR,
March 1, 1881.

H. M. TELLER,
Secretary.

FORESTRY DIVISION, UNITED STATES DEPARTMENT OF AGRICULTURE.—By the provisions of "An act making appropriations for the legislative, executive and judicial expenses of the Government for the year ending June 30, 1877, and for other purposes," approved August 15, 1876, the Commissioner of Agriculture was required to appoint some man of approved attainments, and practically well acquainted with the methods of statistical inquiry, with a view of ascertaining the annual amount of consumption, importation and exportation of timber and other forest products; the probable supply for future wants; the means best adapted to the preservation and renewal of forests; the influence of forests upon climate, and the measures that have been successfully applied in various countries for the preservation and restoration or planting of forests; and to report upon the same to the Commissioner of Agriculture, to be by him transmitted in a special report to Congress.

On the thirtieth of August, 1876, Hon. Frederick Watts, then Commissioner of Agriculture, appointed Dr. Franklin P. Hough, of Lowville, New York, to the discharge of this important duty.

Quite voluminous and valuable reports upon forestry were made by Dr. Hough, in 1877, in 1878-79, and in 1882, embraced in three published volumes. They were transmitted to Congress by the Commissioner of Agriculture, as provided by law, and some thousands of copies of each report were printed for distribution.

The first of these reports contains, among other matters, a review of forest legislation in the United States, including the timber-culture act; suggestions and scientific principles having reference to the subject of forest-tree planting, the maintenance of forest supplies, and the future prospects of the country dependent upon this interest; approved methods of management, and the various economies applied in industries dependent upon

forest products; measures adopted in the several States to encourage the growth of timber, with the text of the laws then in force; the results of forest tree planting under the timber culture acts of 1873 and 1874, etc.

In the second volume is contained the account of the legislative action of the General, State and Territorial governments upon the subject of timber planting; various articles upon the cultivation of woodlands and the growth of trees; and much space is devoted to the subject of forestry in its relations to foreign commerce.

The third report of Dr. Hough (1882) was made as Chief of the then recently created Division of Forestry, in the Department of Agriculture. In this report are considered some of the measures deemed of highest importance for the promotion of the national welfare in connection with the maintenance of forest supplies, and the acquiring and dissemination of facts having practical reference to the subject of forestry. The experience is given of other countries which, like our own, were looking forward to a time when the native supplies of timber would no longer meet current and growing wants and the demands of commerce, and when conservation and encouragement in planting would be among the important duties of the government. In this report, also, attention is called to the neglected condition of the public timber, and a plan of management suggested for its protection and maintenance. The subject of experimental forest stations is considered in detail, and suggestions made as to their location and management. Data is also given relating to forest fires; and the statutes of the various States and Territories, relating to that subject, are collected and compared, with a view to ascertain the best measures for preventing such fires or lessening their damages. The use of charcoal for metallurgical purposes, and of bark for tanning, are also made subjects of special inquiry.

In 1884, Hon. N. H. Egleston, who had succeeded Dr. Hough as Chief of the Forestry Division, submitted to the Commissioner of Agriculture a report on forestry, it being the fourth volume of the series. It embraces reports from six of the prairie States on tree planting, conclusions drawn from the returns from those States respecting the collection, preservation and planting of seeds or young trees; reports of Mr. F. P. Baker upon forests, timber culture, etc., in the Southern and Western States, and on the forest conditions and lumber and wood trade of certain States; reports of Mr. B. F. Hough on the kinds and quantity of timber used for railway ties, on the decrease of woodlands in the State of Ohio, on the forest conditions, lumber and wood trade of New Hampshire and West Virginia, and on the production of maple sugar in the United States and Canada; reports of Mr. R. W. Furnas on the forest conditions, lumber and wood trade of the Western States and Territories, on tree growth, age, period of decline, completion of cycle, etc., and on forestry in certain portions of Indiana and Ohio; and the report of Mr. J. B. Brown on the forests of Washington Territory.

The second forestry report of Mr. Egleston is quite brief, and is included in the 1885 annual report of the Commissioner of Agriculture.

In this report the Chief of the Forestry Division refers to the very limited appropriations made for the purpose of forestry investigations covering an area of almost continental extent. It is suggested, however, that through the work that has been done much valuable knowledge has been gained, the publication of which has already been of much service to the people.

Among the subjects treated in this report are trees on the western plains; a summary of the forest area of the States and Territories; increase or decrease of forests; influence of forests upon the flow of streams and upon

floods and droughts; extent and success of tree planting; tree planting by railroad companies; and the observance of Arbor Day.

The forestry report for 1886, is made by Hon. B. E. Fernow, the present Chief of the Forestry Division. This report includes, among other matters, an outline of the work pursued in the Division, a review of the questions which underlie the consideration of Government action in regard to a forest policy, an account of the present condition of forestry in the United States, and a statement of the elementary principles which must be understood before a successful forest management can be established.

The official report of Mr. Fernow for the year 1887, outlines the work of the Forestry Division for the year, and suggests a plan of work for the future. It also contains an account of the forestry conditions and interests in each of the several States and Territories of the Union and, incidentally, such advice in the pursuance of practical forestry as the limited space at command would admit. It states that the work of the Division, in the main, is to act as a bureau of information.

In addition to the regular reports of the Forestry Division, an account of which has been briefly sketched, that Division has prepared and published from time to time interesting and valuable special reports upon subjects relating directly or indirectly to the forestry interests of this country. During the past year, under the direction of the Forestry Division, special agents have severally been engaged in an exhaustive statistical research into the forest conditions of the State of Tennessee; in examining the forest conditions and resources of the Rocky Mountain region; in the preparation of a report showing the dependence of railroad construction upon forest supplies, and giving important practical information to railroad managers regarding possible econo-

mies in the use of timber; an investigation and report upon the relation of charcoal iron works to forestry; reports on the use of timber in mining enterprises, and on the state of wood manufactures, etc.

Although the Forestry Division has no authority or control over the public timber lands, and its functions are advisory only, its work during the first decade of its existence, just closing, has been of great value to the country. It is safe to say that through the labors and influence of this division is owing, in large measure, the general interest now manifested in the preservation and extension of our forests. That so much has been accomplished by this department of the Government may be justly ascribed to the zeal and ability with which the work has been conducted.

ACTION OF THE COLORADO STATE AUTHORITIES.

CONSTITUTIONAL PROVISIONS.—Colorado was the first of the States to embody in her Constitution a clause looking to the care and preservation of forests, and is the only State in the Union which has such a provision in her fundamental law.

In Article XVIII. of our State Constitution are the following sections:

SECTION 6. The General Assembly shall enact laws in order to prevent the destruction of, and to keep in good preservation the forests upon the lands of the State, or upon lands of the public domain, the control of which shall be conferred by Congress upon the State.

SEC. 7. The General Assembly may provide that the increase in value of private lands, caused by the planting of hedges, orchards, and fruits thereon, shall not, for a limited time, to be fixed by law, be taken into account in assessing such lands for taxation.

MEMORIAL OF THE CONSTITUTIONAL CONVENTION. —The constitutional convention also adopted a memorial upon the subject, which was presented to Congress in March, 1876. The action of the convention in this matter was largely owing to the personal influence and exertions of F. J. Ebert, E. T. Wells and C. P. Elder, members of the convention.

The memorial set forth, among other considerations, the great attention that should be directed to the care and preservation of our native forests, as being one of the important resources upon which the welfare of the people depends; the absence of timber in the plains region of Colorado, and the serious injury which the mountain forests have already suffered through the ravages of fire, the construction of railroads and the reckless devastation of timber in cutting and transporting it; the calamitous results of destroying the forests, and the advantages that would accrue from their preservation, including their beneficial influence upon climate and vegetation; the office performed by forests in the conservation of moisture and in protecting the sources of water supply; historical precedents showing the evils attaching to nations and people from the improvident use and destruction of their native forests; an account of modern European forestry systems; asks the General Government to transfer to the States and Territories the control of the public forests within their borders, together with such lands of the plains region as might be needed for the future culture of forest trees; and recites the dependence of agricultural operations, in this region, upon irrigation enterprises, which in turn depend upon the forest-protected mountain streams.

The closing paragraph of the memorial reads as follows:

In contemplation of the above-stated reasons, this convention respectfully suggests to Congress to put the respective forests and waste

forest grounds of all those regions where irrigation has to be used for agricultural purposes, under the control of the respective Territorial or State governments.

Bills were introduced at the first session of the State Legislature for carrying into effect the intentions of the constitution in respect to timber preservation, etc., but final action was not reached before adjournment.

The memorial was also duly presented to Congress by Hon. T. M. Patterson, the Colorado representative at that time, but no affirmative action was taken upon it.

COLORADO STATE FORESTRY ASSOCIATION. — Subsequently, the forestry question in this State slumbered, or at least remained in abeyance, until the year 1884. In that year, through a series of newspaper articles published in the *Colorado Springs Gazette*, renewed interest in the subject was excited. In November, 1884, the Colorado State Forestry Association was organized. That body prepared and submitted to the Fifth General Assembly of the State the text of a forestry bill, which, with some modifications became a law April 4, 1885.

FOREST LAWS OF THE STATE. — The act, referred to above, creates the office of State Forest Commissioner, constitutes the county commissioners and road overseers throughout the State forest officers in their respective localities; and imposes upon the officers so constituted certain duties with respect to the care of woodlands, and the encouragement of forest-tree planting.

The act proceeds upon the assumption that *ownership* of the forests is a matter subordinate to their *preservation*. Its provisions are good, but not fully operative, for the reason that the State has no authority or control over the public timber-lands, which comprise the principal forests of the State. As first enacted, the law failed to make any provision for the pay and traveling allowances of the State Forest Commissioner; this fault has since been remedied by an amendatory act.

Under existing laws the functions of the State forest officers are, in a measure, advisory and educational.

For several years statutes have been in existence in this State prescribing penalties for the firing of timber or prairie lands, caused by individuals or railroads, or for the wilful cutting or injury of trees or timber, or for damage done to planted trees by domestic animals.

Our State laws also provide for the paying of certain premiums for the planting of forest trees; and exempt from increased assessment valuation, for a term of years, lands made more valuable through the planting of forest or fruit trees.

In March, 1885, acts were passed prescribing penalties for the setting of fires, causing injury to lands of others, and for failure to extinguish camp-fires; and the respective boards of county commissioners are required to cause to be erected, in conspicuous places along the public highways, notices warning persons to extinguish camp-fires, and citing the penalties for failure so to do.

STATE AGRICULTURAL COLLEGE.—The following correspondence will show to some extent the forestry work of the State Agricultural College, and the interest taken in the subject by the college authorities:

Office of STATE FOREST COMMISSIONER,
COLORADO SPRINGS, COLO., November 21, 1887.

PRESIDENT C. L. INGERSOLL,
State Agricultural College,
Fort Collins, Colo.

MY DEAR SIR:—I believe the law creating the State Agricultural College does not specifically provide for teaching, in that institution, the principles of or conducting experimental work in forestry. If I am right in that regard, is not the law defective in a most important particular? No doubt you are aware of the specially intimate relations which exist in this State between agriculture and the mountain forests and streams. I presume you have duly considered the vital dependence of our great irrigation systems and rapidly growing farming interests upon the waters.

which flow from the mountains, and the necessity for carefully guarding their sources; and that you also appreciate the beneficial climatic influence of forests. In brief, it may be assumed that you quite justly estimate the immense value of forests to this commonwealth.

Although the State law may not in terms require, on the part of the college authorities, special attention to forestry subjects, I have the impression that more or less work of that nature has been done there. It will oblige me greatly if you will kindly inform me as to the scope and extent of the work that has been thus performed, and what further facilities, if any (in the way of legislation or otherwise), for the prosecution of that branch of study or experiment, are by you deemed necessary or important.

With assurances of highest esteem, etc.,

I am, very truly yours,

EDGAR T. ENSIGN.

At the request of President Ingersoll, reply to the foregoing was made by Prof. Cassidy, of the College Faculty, as follows:*

FORT COLLINS, COLORADO, October 31, 1888.

HON. EDGAR T. ENSIGN,
Colorado Springs, Colorado.

DEAR SIR:—In response to your letter of inquiry of the twenty-first inst., I would say that while the law does not speak specifically of forestry in defining the curriculum of the agricultural colleges, still under the broad mantle of the word "agriculture" is embraced and implied that instruction shall be given and experiments conducted in forestry, in common with other branches of agriculture in these schools; and no doubt wherever agriculture is really taught and practiced in schools of agriculture, forestry comes in for its share of the time devoted to agricultural subjects.

In this college, instruction is given during the school year in each of the divisions of agriculture, embracing, besides the culture of farm crops and the management of live stock, floriculture, vegetable gardening, pomology, forestry and landscape gardening.

The sciences underlying agriculture are taught in the course given in agricultural chemistry, botany, entomology and meteorology,

*The subjoined communication is substituted for one of a similar character received in November, 1887.

coupled with which are abundant means for illustrating the practical phase of the question in the ample grounds furnished with plant growth adapted to the requirements of this climate, to all of which the student has daily access, and with which he may and does have personal acquaintance in the various duties required of him throughout the college year.

Class-room instruction in forestry is given by lectures, and embraces a consideration of the subject in reference to the climate and meteorological influences of forest tree growth, and the importance of the subject not only to the dweller on the plains, but generally to the whole country.

The propagation, planting and management of forest trees and the conservation of forest tree growth are duly considered, and their influence on growing crops, orchards, gardens, etc., fully exhibited.

Experiments in practical forestry have for their object the production of such tree growth as would be likely to succeed on the plains, and of which there are over twenty acres on the College farm, comprising coniferous and deciduous species likely to succeed here.

In scientific forestry, records have been taken for three seasons on the rate of growth of several species of trees and culinary vegetables, and on the period of leafage and their maturity in the fall. These records are valuable in affording a basis of comparison with similar records elsewhere, and in enforcing a better knowledge of the vital processes of plant growth.

In respect to the apple, pear and plum, they indicate to us that such as leaf and flower too early in spring are not valuable for the production of fruit in this region of late spring frosts.

Not many are aware that our hardy trees, in order to survive the winter, make their growth early, the balance of the season being devoted to its maturation, which suggests that all cultivation or other stimulus to active growth should cease early, that this safeguard of early determinate growth against the fatalities of winter's frosts be accomplished in due season.

Respectfully yours,

JAMES CASSIDY,

Professor of Botany and Horticulture, State Agricultural College.

Under the provisions of the "Hatch bill," which appropriates money for the establishment of experimental stations in connection with the several State Agricultural Colleges, and by virtue of an act of our last General Assembly, which authorizes four such stations to be established in Colorado, it is presumed that more exper-

imental and diverse forestry work will be done by the college authorities in the future than in the past.*

GENERAL EDUCATIONAL WORK.—It has been well said by a recent writer in *Garden and Forest* that the present field of usefulness for State forest commissions is limited, and that their work must be, in large measure, advisory and educational. In our own State these conditions have been recognized from the first, and hence the strenuous efforts made by friends of the forests to arouse public interest for their preservation. By newspaper articles, by the circulation of papers, pamphlets and official reports, by the formation of a State Forestry Association, by legislative memorials, and, finally, by the institution of a State Forest Commission, the people of Colorado have had their attention called to the evils of forest destruction, and the necessity for reform. Also, by Arbor Day proclamations, circulars of the Superintendent of Public Instruction to teachers and school officers, and the frequent and wide distribution of circulars and other printed matter from the office of the State Forest Commissioner†, the need

*In accordance with the provisions of the State law, the State Board of Agriculture has already located experimental stations in the counties of Rio Grande and Bent, and taken preliminary steps for locating one in El Paso county. The law also provides that a station of this kind shall be located in Delta county.

†Circular No. 7, issued August 3, 1888, by the State Forest Commissioner, is too voluminous to form a part of this report. Its table of contents is as follows:

I. OUR NATIVE FORESTS.
   Forest Fires.
II. FOREST TREE CULTURE.
   The Office of Trees, Groves, Shelter Belts, etc.
   What Kinds of Trees to Plant.
   Trees Adapted to High Altitudes.
   Street and Highway Planting.
   When and How to Plant.
   Timber Culture Without Irrigation.
   Transplanting Evergreens.
III. INCREASING THE DURABILITY OF TIMBER.
   Decay of Wood.
   Time of Felling.
   Treatment After Felling.
   Coatings to Keep Out Moisture.
IV. CONCERNING THE FOREST LAWS.
   Action of the Federal Government.
   Timber from Mineral Lands.
   Rights of Homestead or Pre-emption Claimants to Timber.
   The State Forest Laws.
   Premium for Growing Forest Trees.

of forest preservation and tree planting have been further urged upon our people.

Public meetings have also been held in many parts of the State for the purpose of discussing the forestry question, especially as it might apply to local conditions. The work being done in this connection by the State Agricultural College, has been previously noticed in this report.

There has been no available fund with which to purchase forestry works. A limited number of volumes, however, have been obtained by voluntary contribution, the most of which have been placed in public libraries. Acknowledgment should be made to Dr. J. C. Brown, of Haddington, Scotland, for several sets of his valuable works upon forestry subjects.

The fruit of all this agitation is apparent in a greatly improved public opinion, which fully sustains the forest officers of the State in the performance of their duties, and gives countenance to all associated or individual efforts in the interest of forests. If, in the near future, there can be general and united action on the part of all interested in the saving and extension of the public forests, and this combined influence brought to bear upon Congress, it is believed that effective and early remedial legislation can be secured.

CO-OPERATION OF FEDERAL AND STATE AUTHORITIES.—Believing that the forestry interests of the State would be promoted by a more active and hearty co-operation of the Federal and State authorities than has heretofore existed, I have endeavored to effect this object. The appended correspondence upon the subject will explain itself:

Office of STATE FOREST COMMISSIONER,
COLORADO SPRINGS, COLO., June 4, 1887.

HON. W. A. J. SPARKS,
Commissioner of the General Land Office,
Washington, D. C.

DEAR SIR:—In April, 1885, the General Assembly of this State passed an act creating the office of State Forest Commissioner, and constituting the county commissioners and road overseers throughout the State, forest officers in their respective localities. At the late session of the legislature the law was strengthened in some particulars. Under these acts it is made the duty of the forest officers to protect, to the extent of their power, the forests from fire and depredation, and to encourage, by all proper means, the planting of forest trees. Other statutes, in force here, impose penalties for the wilful or careless setting of forest fires, for failure to extinguish camp fires, etc., and require the posting of notices, along the public highways, calling attention to the provisions of the law.

Of course the fact is recognized that the public woodlands here belong almost wholly to the General Government, and that the State has no direct control over them. On the other hand, we believe that forest destruction is calamitous to all, and that the *ownership* of forests is of little importance compared with their preservation or non-preservation.

The efforts of the State authorities in this direction have resulted in some good—but not to the extent desired.

Permit me to say that, so far as may be desirable and practicable, I will heartily co-operate with you in all just measures for the protection of the public forests of this State, and, so far as possible, will secure like co-operation on the part of the local forest officers. We believe that the economical use of timber by the inhabitants should not be unduly restricted, but that depredations, wasteful use and fires should be prevented. In other words, let proper and necessary use be made of *timber*, but preserve the forests.

Should you be pleased to regard my proposition with favor, will you be so good as to indicate in what manner we can best aid in the protection of the public forests.

Allow me to say, also, that it might be advantageous for me to know the names and addresses of the Special Timber Agents, etc., of your office in Colorado.

I remain, very respectfully, yours,

EDGAR T. ENSIGN,
Commissioner.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
WASHINGTON, D. C., June 21, 1887.

EDGAR T. ENSIGN, ESQ.,
Forest Commissioner,
Colorado Springs, Colo.:

SIR:—I am in receipt of your letter of the fourth instant, advising me of your desire to co-operate with the officers of this Department in the preservation of forests in Colorado, and to secure such co-operation on the part of the local forest officers in the several counties of the State, and requesting me to indicate in what manner this can best be done.

I am gratified to receive the assurance of your co-operation, and that of the local forest officers, in the efforts of this Department to protect the public timber lands in Colorado, and would suggest that the method of so doing is one for your consideration in the light of your information and authority.

I shall take pleasure in instructing the special agents of this office to confer with you and with the local forest officers, and to avail themselves of any information and assistance that you and the county officers may be able to afford them.

As requested, I append the names and addresses of the special agents of this office now operating in Colorado.

* * * * * * * *

Very respectfully,

WM. A. J. SPARKS,
Commissioner.

Office of STATE FOREST COMMISSIONER,
COLORADO SPRINGS, COLO., July 18, 1887.

HON. WM. A. J. SPARKS,
Commissioner of the General Land Office,
Washington, D. C.:

SIR:—Your favor of the twenty-fifth ultimo, in reply to mine of a previous date, was duly received.

Permit me to say further, with respect to the preservation of the public forests in this State, that, without reflecting upon the zeal or ability of the special agents of your office operating in Colorado, the forests here, through fire and depredation, are meeting with rapid

depletion, and unless a speedy remedy can be applied, will be destroyed. The increase of population, railroad building, mining, lumbering, charcoal manufacture, etc., and the careless use of fire by campers, tourists and others all tend in the direction of forest destruction.

Our State authorities are quite fully alive to the necessities of the case, but are hampered in their action for the reason that they have no control of the public forests.

We heartily favor the necessary use of grown timber, but desire to maintain the integrity of the forests. We believe that if the public forests of the Rocky Mountain region can be preserved, and the sources of streams protected, the Government, in the prosecution of forestry work, need not plant a tree. In other words, maintain the natural forests, and the streams (for irrigation uses, etc.), and all necessary planting will be done by individuals.*

Although the State has memorialized Congress, asking for the custody and control of the public timber lands within her borders, the people here will cheerfully support any other policy more likely to promote efficient forest protection.

In the course of a recent investigation on my part of the forest conditions of the Rocky Mountain region, it appeared that the number of Government timber agents in this section was very inadequate.

* * * * * *

That in certain of the Territories you do not permit the survey of timber lands seems to me a wise precaution.

For the sake of gaining further information on the subject, and possibly to aid in securing needed legislation, allow me to ask:

1. Under existing laws, what sum of public money can be annually used for the protection of public timber lands?

2. What, approximately, is the proportionate relation between *prosecutions* for timber depredations and *convictions?*

*I now think it is the pressing duty of the Government not only to stop the further waste and destruction of public forests, but, by experimental forests tree planting and other methods, to encourage and promote, to the greatest possible extent, the culture of trees and forests.

3. What ratio (approximately) does the amount recovered, in fines, etc., bear to expenditures?

4. What is the number of Government timber agents employed in the State of Colorado, and in the Territories of Wyoming, Montana, Idaho, Utah and New Mexico, respectively?

5. Would you favor another or different system than the present one for the protection of the public forests? And if so, what—briefly stated?

* * * * * *

I am, very respectfully, yours,

EDGAR T. ENSIGN,
Commissioner.

The reply, if any, of the Commissioner to my communication of July 18, was not received by me. Subsequently, however, I was favored with printed copies of the annual reports of the Commissioner of the General Land Office for the years 1886–7, from which I learn that in protecting timber on public lands special agents were employed in 1886 for an aggregate length of service equivalent to twenty-one agents for twelve months; and during the year 1887 special agents were employed for an aggregate length of service equivalent to twenty-six agents for twelve months, and one for eight months. One thousand two hundred and nineteen cases of depredations or timber trespass were reported upon in 1886, and one thousand and eleven cases in 1887, involving a value in timber and timber products amounting to $15,488,614.86, recoverable to the United States. The total amount actually recovered to the Government during the two years through judgment, fines, sales of timber, and compromises, so far of record in that office, is $229,727.53, with perhaps an equal amount recovered through legal proceedings not yet reported; leaving, as will be seen, over $15,000,000 in value, for the recovery of which legal proceedings have been instituted or recommended. Depredations upon the pub-

lic timber by powerful corporations, wealthy mill-owners, lumber companies and unscrupulous monopolists, though to a certain degree checked, are still being committed to an alarming extent and great public detriment.

In the early part of July, 1887, I forwarded to the County Commissioners and Road Overseers, in each of the timbered counties of the State, circular letters calling their attention to the forest laws, and requesting them to heartily co-operate with the Federal officers in the protection of the public forests.

I also communicated, personally or by letter, with the Special Agents of the General Land Office in this State, assuring them of a desire on the part of the State authorities to render aid and co-operation in the protection of public timber. At the same time, I placed in the hands of each of such agents an autograph letter, addressed to the local forest officers, requesting them to give the former all possible aid and co-operation in the performance of their duties.

During the years 1887–8, the State authorities have brought to the attention of the Federal officers in the State a number of cases of trespass (actual or presumptive) upon the public timber lands in different sections of the mountain region. I am unable to say what action was taken upon them. It should be stated, in this connection, that in the prosecution of suits in behalf of the Government, the prosecuting officers have labored under many disadvantages, notably from a deplorable lack of means and assistance for the collection of evidence and preparation of cases.

At the close of the year 1887, in response to a letter of inquiry to one of the most active and efficient special timber agents in the State, I was informed that he had, during the year, reported some forty cases of timber trespass, upon perhaps twenty of which either criminal

or civil proceedings had been ordered; and that he believed that if the intention of the Government to prosecute trepassers should become fully known the trespasses would, in large measure, be abandoned.

FORESTRY ASSOCIATIONS.—During the last few years, associations have been formed in various parts of the country for the purpose of directing public attention to the need of forest conservation and tree culture. The first of these organizations was the National Forestry Association, formed in 1875, under the direction of the late Dr. Warder, a noted arboriculturist, resident of Ohio. This Association in 1882, was merged in the American Forestry Congress, which is still in active existence. It has held annual meetings at Cincinnati, St. Paul, Montreal, Washington, Saratoga, Boston, Denver, and Springfield, Illinois. Convening, in successive years, at widely separated points, it has been enabled to arouse a strong local interest in forestry matters in different sections of the country. It serves, also, to greatly promote the formation of local societies.

The Southern Forestry Congress, representing the Gulf States, has been in existence for several years. Its objects are similar in kind to those of the American Forestry Congress.

State Forestry Associations have been formed in Ohio, Colorado, New York, Pennsylvania, and some of the other States. It is gratifying to note manifestations of a wide and growing interest in the forestry question.

In some of the States, the Horticultural Associations make forestry a leading feature. This is notably the case in the States of Massachusetts, Michigan, Iowa and Kansas. In Maine the State Grange, with a membership of 15,000 farmers, is taking active steps in the promotion of forestry interests.

The work performed by the Colorado State Forestry Association, since in organization in 1884, is to well

known to need extended comment. That it has awakened public interest in a subject of great importance to the people of this State, and been the promoter of most useful legislation, is all that need be said concerning it. In January of the present year, this association was consolidated with the Colorado State Horticultural Society, the new organization taking the name of the Colorado State Horticultural and Forestry Association.

The discussions and publications of these various associations have greatly aided in directing attention to the dangers threatening our country through neglect of its forestry interests; and they have also clearly shown the need of remedial legislation.

FORESTRY COMMISSIONS.—In a recent editorial article in *Garden and Forest*, entitled "Forestry Commissions," the writer discusses the question as to how the Forest Commissions, which have recenty been instituted in several of the States, can perform their duties so that the communities which created these Commissions can derive the greatest benefit therefrom. With the exception of New York and California—in the latter of which land has been presented to the Commission to enable it to carry out various experiments in silviculture, there are no State forests to administer, nor have the States any direct authority over the public timber lands.

* * * * * * * * *

In other States, where there are no State-forests to administer, and in which the Commissions are almost always left inadequately supplied with money, it is not easy to see how they can exert their influence directly. Administrative powers they can not have, for no State forests are placed under their control; and the time has not yet come when private owners of forest property will turn it over to be administered by State officers. It is evident, therefore, that the field of usefulness for these Commissions is limited, and that their work must be advisory and educational. They must become, if they are to justify their existence, the teachers of the people in all that relates to the forest. The Pennsylvania Commission, backed by an active

society interested in forestry, and equipped with a special organ devoted to disseminating information relating to the forest, has already made a beginning in this direction. But its efforts, as is natural in a new organization, lack system; and this is true of the educational work attempted up to the present time by the Commissions in other States.

As our advice has been asked, we shall be permitted, perhaps, to say that the Forest Commissions of the different States, and their friends and all others interested in this country in the question of forest preservation, will accomplish nothing until they unite together in the adoption of some general scheme for educating the people of the United States in the questions relating to the forest. What is needed in this country now is such a discussion of the forest question, such an awakening of the intelligence of the American people to the importance of the forest, that it will be possible to secure (1) legislation from Congress, under which the forests upon the National domain may be administered for the good of the whole people of the United States for all time, and not for rings of contractors and timber thieves, whose only interest is to cut every stick of timber, and then, after the forests are utterly ruined, abandon the land to hopeless worthlessness. Such an awakening is needed to secure (2) the enactment of laws in every State, under which forest property may be made secure from depredation and needless fires, and a condition of public intelligence which will make it possible, in the case of the forest, to subordinate private interest to the general good. But before this time comes the public of the country must learn that the welfare of the public is often dependent on the forest of the individual, and that if the individual is allowed to do with it all he may wish, he endangers the community. The time probably will come when the farmers of the United States will realize that the pasturage of animals in their woods is not only an injury to themselves, personally, but to the whole community, and will consent to forego this privilege; and they will learn that the clearing of the water-shed of a mountain stream or lake may bring incalculable injury to persons whose names they have never even heard. But the mental development which will make intelligent legislation upon such subjects possible can only come after long years of discussion and education. In inaugurating such discussion and in stimulating such education State Forestry Commissions will find their real and only field of usefulness, and failing in this they will show their unfitness for existence.

CONSERVATION OF WATER.—The subject of water storage, and how to use water supplies to the best advantage, is attracting wide attention in Colorado and other portions of the Rocky Mountain region. The

rapid extension of farming operations here, dependent chiefly upon systems of irrigation, has made the water question a leading one.

In February last, at the request of a committee of citizens, the Governor issued the following call for the assembling of a convention to consider the water storage question:

STATE OF COLORADO, GOVERNOR'S OFFICE,
DENVER, COLO., February 17, 1888.

In obedience to the above request, coming from a committee of citizens, I hereby call a convention to be held in Denver on the fifteenth day of March.

As the convention will consider the question of reservoirs and other methods by which the arid lands of Colorado may be irrigated, so as to contribute to the prosperity of our people, I ask that those interested in the future welfare of the State will take an interest in the matter, and give us a convention of such commanding influence as will gain the attention and aid of the National Government to our efforts to utilize the waters of the mountain streams, so as to convert our barren territory into fruitful fields and happy homes.

This subject is of great and increasing importance, and is worthy of our best thought and most vigorous efforts. Neglect and indifference will never conquer the desolation and barrenness of our thirsty plains, while well considered, unanimous and harmonious action will bring success, and give fertility and verdure to millions of acres of the most productive land in the Nation.

ALVA ADAMS.

The convention was held at the time named in the call; the attendance was large—most parts of the State being represented. Many papers of interest were read, and the following resolutions adopted:

WHEREAS, A large portion of the land at the base of the Rocky Mountains is arid land, requiring water for irrigation in order to make it productive; and,

WHEREAS, There is a large area of arid land on the western slopes of the mountains that is subject to the treaty with the Ute Indians; and,

WHEREAS, Immense quantities of water flow annually in destructive floods from the Rocky Mountain regions into the great arteries of the Mississippi river, and the rivers taking their waters from the western slopes of the mountains in the State of Colorado, necessitating great

expenditures for levees on the Mississippi river, which water, if saved by reservoirs, would be utilized in reclaiming millions of acres of rich and fertile lands; and,

WHEREAS, Neither individual enterprise and capital, nor the resources of the State are adequate to the reclamation of the agricultural possibilities of the lands in the arid regions; and,

WHEREAS, The Mountain States have the same claims upon the General Government for appropriations as are conceded to the Valley States; now, therefore,

Resolved, That we urge upon Congress the immediate necessity of making liberal appropriations of money to be expended in the construction of reservoirs and canals for storing water in this State for irrigation purposes.

Resolved, That an Inter-state Convention of all the States and Territories of the arid region should be called to consider the reservoir and canal questions; and that the Governor of Colorado be requested to unite with the president and secretary of this convention in issuing a call for such convention to be held at such time and place as shall be hereafter determined.

Resolved, That we urge upon our Senators and Representatives in Congress the importance and necessity of their taking immediate measures toward securing the prompt and speedy recognition by Congress of the just and equitable claims and demands made and presented by the people of Colorado, and set forth in these resolutions.

A carefully prepared memorial to Congress was also adopted, in which, after a statement of facts, that body was asked to:

Pass such bill or bills, granting to the State of Colorado such financial or other available aid as will be deemed adequate to construct and maintain dams and reservoirs, with the necessary canals and ditches leading to the same, to collect and retain the water which now annually runs to waste, to the end that said water may be used for irrigation and domestic purposes.

Among the papers read at the convention was one by Hon. E. S. Nettleton, entitled, "First Methods to Adopt for Conserving the Waters of the State." I will extract from it a few paragraphs:

* * * * * * * *

I am led to suggest a few methods for increasing and extending our water supply, which will be as useful after our reservoir system is established as they will be before.

The fact that our system of farming has changed within the past few years by substituting for the summer crops those which require water earlier in the spring and later in the fall makes it more important than ever to secure as uniform a flow of water in our irrigation streams as is possible to do throughout the whole irrigating season.

PRESERVE THE FORESTS.—To accomplish this end I call your attention first to the importance of the preservation of our mountain forests, and the re-covering of the mountain districts with a new growth of timber. The details of how this work is to be accomplished, and the arguments proving the benefits to be derived therefrom, I will leave for abler ones to discuss. I take it for granted that some will say: "This forestry subject is one of the future; we want something of immediate benefit and relief." While this may be true in part, yet the protection and preservation of the mountain forests of the present day is an immediate necessity if we desire to protect our streams from an intermittent and diminished flow.

Neglecting to take steps towards preserving the forests and encouraging the re-covering of the mountain sides with timber, because we can not see immediate and profitable returns, is no good excuse.

We should do this much for the benefit of those who are to follow us, and who will make this country equal at least to any of the irrigated countries in olden times, which history tells us have supported a much denser and a higher civilized population than is possible to support in a country where the people have to depend on rain-fall for a more or less successful agricultural industry.

We have none too soon established a commission whose duty it is to look after and to guard our forests. Although the beneficial results of the work of the Commission may at present seem almost fruitless, we should be a little patient and give the trees time to grow before we can count on a bountiful harvest.

Another paper of great interest was that of Hon. Henry Lee, entitled "Practical Methods to Adopt for Storing Water in the Mountains." This paper very ably advocated the idea of retaining water (or retarding its flow) in the mountain basins, at the heads of streams, by a system of ditches which would take the water out of the streams, distribute it over the surrounding slopes —securing its *gradual* return to the natural channels, and thus effect a more regular and continous flow. Under this plan no costly engineering works are required, and no expensive reservoirs. By this means,

also, might be caused the formation of large bodies of ice at the higher elevations; this, gradually melting during the warmer seasons, would aid in preserving a uniform flow of water.

RESULTS OF THE CONVENTION'S WORK.—As a result of the work of the convention, supplemented by the efforts of our Congressional delegation, Congress, at its last session, authorized an appropriation as follows:

For the purpose of investigating the extent to which the arid region of the United States can be redeemed by irrigation, and the segregation of the irrigable lands in such arid region, and for the selection of sites for reservoirs and other hydraulic works necessary for the storage and utilization of water for irrigation, and the prevention of floods and overflows, and to make the necessary maps, including the pay of employés in field and in office, the cost of all instruments, apparatus and materials, and all other necessary expenses connected therewith, the work to be performed by the Geological Survey, under the direction of the Secretary of the Interior, the sum of $100,000, or so much thereof as may be necessary. And the Director of the Geological Survey, under the supervision of the Secretary of the Interior, shall make a report to Congress on the first Monday in December of each year, showing in detail how the said money has been expended, the amount used for actual survey and engineer work in the field in locating sites for reservoirs, and an itemized account of the expenditures under this appropriation. And all the lands which may hereafter be designated or selected by such United States surveys for sites for reservoirs, ditches, or canals, for irrigation purposes, and all the lands made susceptible of irrigation by such reservoirs, ditches or canals, are from this time henceforth hereby reserved from sale as the property of the United States, and shall not be subject, after the passage of this act, to entry, settlement or occupation until further provided by law.

I understand that, under the authority so granted, surveys of the character named have already been commenced in this State.

Annual Rain-fall.

Questions relating to the annual rain-fall of the State, its amount, whether increasing or diminishing, and how affected by cultivation of the soil, etc., may be of less immediate importance than those relating to the utilization of the moisture we have. Conceding this to be true, it may be said that the subject is an important one in connection with the growth of vegetation over wide areas of the State. If, by meteorological observations, continued through a series of years, the average, annual rain-fall, humidity, temperature, and other climatic conditions of a region can be determined, and if this be followed by intelligent agricultural and arboricultural experimentation, long steps have been taken in the process of making our waste lands fruitful. That the "Great American Desert" was a verity and is fast becoming a myth, is known to most of us. We can easily remember when certain interior points in Kansas and Nebraska were considered the utmost western bounds of successful agriculture. These bounds have been steadily pushed westward, until now they seem about to vanish.

Does Tillage Increase Rainfall?—At an agricultural fair, held in the fall of 1887, in Nebraska, almost in the center of what used to be known on the maps as the so-called "Desert," General Morrow delivered an address in which he undertook to account for the large increase in the annual rain-fall. His explanation is interesting in this connection, and is reproduced:

I have always thought that there was an abundance of moisture in the clouds of this interior section, but that conditions favorable to its precipitation in the form of rain and dew were wanting. The earth and the sky are reciprocal in their relations. They give and take from each other. A parched desert having nothing to give in return, receives no moisture from the passing clouds. For countless ages these prairies have been scorched by fires, pelted by storms of rain and hail, and

trampled upon by innumerable herds of wild animals. The effect of this has been to pack the earth until it has become as compact as a rock. The beating power of rain or hail is far greater than the ordinary observer comprehends. When the rain falls on a primitive soil the larger part runs off in torrents and finds its way to the sea. The baked, storm-beaten and trampled earth, like a sick man, refuses its nourishment. Beyond doubt, this is the reason why you have so many physical proofs around you of enormous devastations committed by running water. When the land is tilled this will cease. Cultivated ground absorbs a large portion of the water that falls upon it, and retains it like a sponge. It thus becomes a reservoir of moisture for the nourishment of crops in seasons of drought. The turning over of the soil in large tracts of the country presents to the atmosphere this absorbed surface. The soil gives this absorbed moisture back to the atmosphere by evaporation. Thus, year by year, as the cultivation of the soil is extended, more of the rain that falls is absorbed, to be given off by evaporation, or to remain in store to nourish plants and grasses.

The Coming Forests of the Plain.—The following lines, written several years ago by Major Henry McAllister, Jr., of Colorado Springs, may be considered almost in the nature of prophecy, so nearly have succeeding events conformed (in kind at least) to the prediction then made:

I do not believe that the great plains east of us can be forested until the rain-fall is increased. I do believe that it will be increased by the gradual but sure cultivation of the soil in Kansas and Nebraska and the march of cultivation to the west from the Missouri valley. Bodies of water furnish rain to contiguous lands. Cultivated fields, by holding the water that falls upon them, act as reservoirs of water. The settlement of Illinois, Kentucky and Tennessee greatly increased the rain-fall in Iowa and Missouri. The settlement of the last two States largely increased the rain-fall in Kansas and Nebraska. When the writer came to Colorado, in 1872, he was told by the officials of the Kansas Pacific Railroad that nothing would ever be grown west of Salina, as the rain-fall was insufficient. Now immense crops of corn, wheat and oats are grown every year far to the westward of that town. At places in Nebraska, along the line of the Union Pacific and Burlington and Missouri Railroads, the rain-fall has greatly increased within a few years. The buffalo grass is being killed off by moisture where nothing else could grow ten years ago. I am sure that a field of corn exercises the same influence upon the atmosphere

that a forest of like extent does, and it only requires three months to grow it. In a few years there will be an irruption of corn and wheat fields upon the eastern borders of Colorado, and stall-fed cattle and sheep will take the place of our range stock clear up to the base of the mountains. Forests of deciduous trees will beautify the rolling prairies, and I trust that you may live to recline in luxurious ease within their shade.

Annual and Mean Annual Precipitation, at Certain Stations of the Signal Service, U. S. Army.

COMPILED FROM THE COMMENCEMENT OF OBSERVATIONS TO 1887, INCLUSIVE.

STATIONS.	ESTABLISH'D	1871.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	MEAN ANNUAL.	
		Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Inch	Yrs	Inch
Denver, Colo	Nov. 19, 1871	. . .	18.05	11.18	13.46	17.25	20.12	16.38	15.51	10.86	9.58	12.78	14.49	19.49	15.07	15.95	15.07	12.49	16	14.86
Pike's Peak, Colo	Nov. 1, 1873	. . .	. . .	. . .	26.86	24.74	23.87	25.58	42.87	39.82	40.65	44.57	28.82	18.17	9.28	30.38	. . .	. . .	12	29.63
Las Animas, Colo	Oct. 1, 1881	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	11.12	15.70	14.23	12.78	13.46	5	13.46
Dodge City, Kas	Sept. 15, 1874	. . .	. . .	. . .	. . .	18.78	15.40	27.89	17.96	15.43	18.12	33.55	13.14	26.50	30.36	23.83	19.25	15.71	13	20.77
Fort Elliott, Texas	Nov. 29, 1879	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	16.79	16.16	24.76	28.21	33.91	36.97	*21.65	22.83	8	25.08

*Eleven months.

COLORADO METEOROLOGICAL ASSOCIATION.—Meteorology, defined as "the science which treats of the atmosphere and its phenomena, particularly in its relation to heat and moisture," is likely to form, in the future, a useful adjunct to agriculture and forestry in this region.

The Colorado Meteorological Association was organized, and incorporated under the State law, at Denver, December 30, 1884. The objects of the Association, as set forth in its articles of incorporation, are as follows: "Observing, collecting, recording and publishing the meteorological phenomena, occurrences and changes within the State of Colorado, and all purposes and objects connected with, incident to, or necessary for the effective carrying out of the above purposes."

The Association holds regular annual meetings, at which time is elected a board of directors. The directors for the present year (1888) are: Charles F. Wilson, president; S. E. Solly, M. D., first vice-president; Prof. E. Mead, second vice-president; Dr. W. A. Jayne, third vice-president; Prof. F. H. Loud, director of observations; S. A. Fisk, M. D.; Charles Dennison, M. D.; E. S. Nettleton; Joseph Cornforth. Secretary and treasurer, T. W. Sherwood.

In March, 1886, a State Weather Service was organized, and since that time meteorological bulletins have been issued by the Association each month, data for the same being collected from all parts of the State. Active co-operation exists in the work of the United States Signal Corps and that of the Association, and their joint endeavors are likely to result in much practical benefit to the public.

NATURAL REPRODUCTION OF FOREST GROWTH.—In estimating those forces which tend to lessen, or mitigate, forest losses, the restorative pro-

cesses of nature should not be lost sight of. That the natural reproduction of forest growth in this State is very considerable, I am not prepared to say; at least, it is not so inconsiderable as to be unworthy of mention.

In the mountainous portions of Colorado, the home of our native forests, excessively arid conditions do not usually prevail; in fact, the rain and snow-fall, in all ordinary seasons, is of such extent as to give the region a character for humidity, rather than its opposite. In this respect the mountain districts of this State compare most favorably with those of neighboring territories at the south and south-west.

Under a proper system of forest management, where only mature trees, or waste, should be removed, and due regard paid to natural germinating processes and the safety and nurture of young trees, the appreciation, or gain, through reproduction and annual growth, would always be large.

In the hap-hazard destructive methods—and absence of all management—which now obtain, nature has but little opportunity to exercise her powers of restoration; and there is danger that regions once forested and well watered, useful and clothed with beauty, may become desolated wastes.

In cases where fires have swept over a tract of woodland, reproduction of the original special seems specially difficult. On many dry, southern slopes, thus denuded, no tree growth whatever succeeds. This is particularly noticeable for the reason that on southern exposures are chiefly found the yellow pine, our most valuable timber tree. On northern slopes, where late melting snows, shade and moisture abound, reproduction reaches its maximum. It is here that the shade-loving, symmetrical spruces meet with most favorable conditions. In higher and more exposed situations, especially where fires have scorched and burned the ground, the hardy

aspen appears in great numbers. Amidst the aspen may be seen an occasional pine or spruce.

In the southern Rocky Mountain region natural forest reproduction obtains only to a very limited extent. In the central and northern portions, the reproduction, though not to be compared, in spontaneity and degree, with that of the Atlantic and other forest areas, is yet a matter of much consequence, and should be promoted by all proper means.

FOREST TREE PLANTING IN THE STATE.

Although the preservation of our native forests may be a paramount duty at this time, forest tree culture is also a duty, and next in order of importance.

In nearly all portions of the State where water can be had for irrigation, trees can be made to grow. The method, or methods, by which they can be grown in certain portions of the plains region, beyond the reach of irrigation, and without the so-called "rain belt," is yet an unsolved problem. It is, however, quite confidently expected that by the introduction of certain hardy foreign species, by the more careful and extended cultivation of some of the native varieties, and by certain prospective experimental work, much may be done to promote the cultivation of trees in the hitherto treeless sections of the State. That crops have been successfully grown in some parts of the plains region without the aid of irrigation, warrants the belief that trees also may be grown there.

NOTE.—In the spring of the present year I was enabled to distribute to about one hundred different points in the State a limited amount of plant material, from which it is hoped some good results will be obtained.

ARBOR DAY PROCLAMATIONS.—For several successive years the Chief Executive of the State has issued proclamations calling the attention of our people to the

advantages to be gained from planting trees, and designating certain days for such observance. The following paragraphs are taken from the proclamations of Governor Alva Adams for the years 1887 and 1888:

I trust that our citizens will observe the day by beautifying their homes, the streets, highways and public places.

To the teachers in our public schools, I would suggest that on this day they give such instruction as will bring to the mind of every pupil the value and beauty of forestry, and to devote a portion of the day to practical experience in the planting of trees in our school yards and other places.

There is an Arabian proverb that, with the planting of a tree, a blessing comes to him who drops the seed. This is a sentiment that should find expression in the life and acts of every citizen of our State. We are to-day enjoying the grateful shade, the scenes of beauty and the fragrant fruitage of those trees whose planting was the thoughtful care of those who first came to this western land. In this arid country, where the fields bloom only by the aid of artificial irrigation, it is not alone the sentiment of beauty, but of utility and profit, that should inspire a general observance of Arbor Day.

Climate, health, comfort, the products of our soil—everything that makes Colorado attractive and desirable—depend to a certain extent upon the influence of forest culture. Let every child, every citizen, plant each year a tree, and a few years would change the aspect of our country; there would remain for those who come after us not only living and beautiful memorials of our labor, but they would cover with verdure the domain where desolation now reigns, and convert the barrenness of the plains into fruitful fields.

The tree, vine and flower are the ornaments with which the Creator adorns the home of man, and he who cares for these children of nature obeys the mandates of Him who placed us here, contributes to the wealth of his country, and augments the happiness of posterity.

Nature has placed us amid kindly surroundings. Nowhere is nature more indulgent. Nowhere does the soil respond with more lavish generosity, or does the sun shine with more genial warmth. Nowhere does the Great Artist paint the bloom of health with such an indelible pencil as under the fair skies of Colorado.

Let us utilize all the resources of art and industry to embellish and beautify these rich gifts of nature by the planting of orchards, forests and gardens. Let us, with tree and vine, shrub and flower, make beautiful and attactive this land in which we live. Pleasure, profit, gratitude and affection should impel us to plant trees and care for them.

The children in our schools, the dwellers upon the farm or in the town, should all give hand to this good work, which will bring rich reward to those who live to-day, and an inheritance of beauty, fragrance, fruit and flower to those who come after us.

ACTION OF THE SUPERINTENDENT OF PUBLIC INSTRUCTION.—Hon. L. S. Cornell, Superintendent of Public Instruction, has also endeavored to promote the observance of Arbor Day and the planting of trees. Following the proclamation of the Governor on that subject, he issued circulars to the teachers and school officers, urging upon them the observance of Arbor Day by planting trees in their school grounds and engaging in appropriate literary exercises.

CIRCULARS OF STATE FOREST COMMISSIONER.—The following circulars from this office, the object of which will be seen, were freely distributed, and published as widely as possible, throughout the State:

CIRCULAR NO. 4.

Office of the FOREST COMMISSIONER OF THE STATE OF COLORADO, DENVER, April 12, 1887.

The growing scarcity of timber, the increased frequency of floods and drouths, the lack of water for irrigation, and other ills attendant upon the destruction of forests, have become known to the people of the State, and earnest endeavor is being made to remedy the evil.

Under recent laws the office of State Forest Commissioner has been created, and County Commissioners and Road Overseers throughout the State constituted forest officers in their respective localities. It is made the duty of these officers to protect from fire and depredation the forests within the State, and to encourage, by all proper means, the planting of trees. Furthermore, all citizens of the State are enjoined to give aid and co-operation in the enforcement of the forestry laws.

While the preservation of our remaining forests is a matter of extreme importance, the great benefits to be derived from the extensive planting of trees should not be overlooked. Groves and trees in the lowlands can not perform the office of forests in the mountains, but

they have, in their place, most important uses. They aid in the conservation of moisture, afford shade and protection from high winds, beautify the landscape, and serve other useful purposes. They should be freely planted on the farms and ranches, about our homes, by the roadside, in the streets and parks of towns, and in all suitable places where water and necessary protection can be afforded.

EDGAR T. ENSIGN,
Commissioner.

CIRCULAR NO. 6.

Office of the FOREST COMMISSIONER OF THE STATE OF COLORADO, DENVER, Feb. 25, 1888.

Next in importance to the preservation of our mountain forests is the growing of artificial forests, groves and shelter belts. For the information and encouragement of *bona fide* timber culture claimants, and others in this State practically interested in the subject of tree growing, the following suggestions are offered:

1. PREPARATION OF THE SOIL.

A proper and thorough preparation of the soil is essential to successful forest tree culture. Unless the ground has already been brought under cultivation, it should be broken and used for a year or two in the growing of some hoed crop, that being preferable to small grain, because it secures for the land just the treatment it needs to fit it for tree culture.

2. WHEN AND HOW TO PLANT.

In this State the spring of the year is usually the best season for planting; the particular time or season in each instance to be governed by attending circumstances.

Under the timber-culture act, not less than twenty-seven hundred trees must be planted to the acre, of which at least six hundred and seventy-five per acre must be growing at the time of making final proofs.

The best authorities recommend close planting, the trees set three to four feet apart each way. Forest trees, when planted close, shade the ground quickly and keep down weeds, grow upright and straight, pruning them-

selves of lateral branches by a natural process, retain the leaves as a mulch, shield each other from drying winds, hold the snow, and soon establish a forest condition. Nature produces forests by planting thickly, and thins by the "survival of the fittest."

Horace Greeley said: "Plant thickly and of diverse kinds, so as to cover the ground promptly and choke out weeds and shrubs, with full purpose to thin and prune, as circumstances may dictate."

3. TIMBER CULTURE WITHOUT IRRIGATION.

An experienced arboriculturist writes as follows concerning the growing of trees in arid and semi-arid districts, where water can not be had for irrigation:

"A correspondent who has a timber culture filing on government land in the eastern part of the State, asks: Can timber be grown here without irrigation?

"We answer, it certainly can. But we must reverse the system of eastern tree culture. There our trouble existed in the excess of surface moisture, requiring drainage from the trees. In preparing for tree planting the land was deeply plowed, thrown up into narrow headlands and the trees planted on the highest part, so the surface water would drain from the trees into the middle, a 'dead furrow,' and be carried from the field.

"Here we must adopt a system of surface drainage to the trees.

"This is done by planting in the 'dead furrow' instead of on the headland. By reversing this order of planting, trees not only receive the benefit of the rain-fall, but the snows drift into this 'dead furrow,' protecting the trees through the winter, and thoroughly soaking the ground when melting in the spring. In addition, leaves and all manner of decaying vegetables drift and collect in this low ground, forming a valuable mulch to retain moisture."

4. WHAT TO PLANT.

Among the hardier forest trees recommended for planting in this State, especially in the plains region, are the cottonwood (broad leaved), Balm of Gilead, Russian mulberry, American white ash, black locust, honey locust, western gray willow, and wild black cherry. In localities south of the Arkansas-Platte divide the osage orange and catalpa speciosa might be tried. It is probable, also, that a fair degree of success might be attained with some of the native species common to dry and exposed portions of the foot-hills and mésas, as for instance: cedar, scrub oak and piñon, which might be propagated from the seed. Where irrigation is practi-

cable, the hickory; butternut, black walnut, white elm, linden, box elder and other varieties of maple are likely to do well.

5. SELECTION OF SEEDS, CUTTINGS, ETC.

Great care should be used in the selection of seeds, cuttings, or seedlings, to insure choice varieties and healthful condition. Seeds should be tested thoroughly before planting, to determine the presence or absence of vitality.

6. CULTIVATION.

While the preparation of the ground and planting are necessary, and important processes, let it not be forgotten that subsequent care and cultivation are requisite to final success. Some recommend mulching the young trees after planting; others say that persistent and continuous cultivation is better.

DISSEMINATION OF INFORMATION.

It is very desirable to learn what species of trees are best adapted to the trying conditions of our plains region, and to determine the best methods of cultivation, etc. Any facts or information which may be obtained upon these subjects, or the result of experiments made in that connection, if transmitted to this office, will be disseminated for the common good.

EDGAR T. ENSIGN,
Commissioner.

TREE PLANTING IN VARIOUS COUNTIES.—In order to learn the extent of tree planting in the State, during the two years last past, letters have been addressed to the County Superintendents of Schools and others, in each county, requesting information upon that subject. Printed circulars were also sent to the respective Boards of County Commissioners, asking for further information in that behalf. A summary of the statements so obtained is appended hereto, the counties being given in order.

Arapahoe.—A large number of shade trees have been planted in this county during the last two years—prob-

ably one hundred thousand and upwards. A large increase of the better varities, maple, elm, ash, etc., is reported. Many of the cottonwoods, planted last year on new additions to the city of Denver, died from neglect and lack of proper irrigation.

Arbor Day of the present year (1888) being stormy, exercises were held indoors in all the city schools, and the following day a limited number of trees were planted in the various school yards. The subjoined item, in this connection, was clipped from the *Afternoon Reporter*, of Denver:

Arbor Day was appropriately observed in all the schools of District No. 2, West Denver, on Monday, April 30, instead of the twenty-ninth, on account of the rain. Every teacher, in accordance with the instructions from the Superintendent, gave a full and detailed lesson on the subject of tree culture. The influence of forests on the climate of a country was explained. The evil effects of forest destruction was illustrated, by pointing to examples like Palestine, some parts of Europe, and even some parts of our own country. The use of timber for fuel, for building purposes, for railroads, for smelting purposes and for the manufacture of furniture was described. Attention was called to the rapid decrease of timber areas in the United States, and the consequent approach of a famine in this material unless provision for a new supply is made. The special need of tree culture in our own State was dwelt upon. To this instruction was added a literary exercise, consisting of short recitations by the pupils of verses suggestive of trees, flowers and vegetation. At the close of the regular school exercises in the afternoon, all the pupils marched out of their respective buildings and planted trees in and about the school grounds. The primary grade of each building was kindly remembered by Mr. E. Millison, who presented to each class two fine rose bushes. These bushes were planted by the little ones. They understand that these bushes are under their special care and protection. The members of the graduating class of the high school planted their customary class-tree, and also replaced those planted in former years which had died.

"In many of the country districts complaint is made that there is no water for irrigating purposes on the school grounds, and that it is therefore useless to plant trees."—*Correspondents: D. S. Grimes and A. D. Shepard, Co. Supt. of Schools, Denver.*

Archuleta.—"In the Pagosa Springs school district, Arbor Day was observed with appropriate exercises. Seven trees were planted; one cedar, one pine and five spruces. The school children were much interested in the work."—*Mrs. Rhoda A. Taylor. Teacher, Pagosa Springs*, 1887.

"Educational work in our county is in a very crude state. Only three school districts, and only two of these have school houses and grounds. On account of a new building in course of construction on grounds of District No. 1, no trees were planted there this year. Vacation in District No. 2, and same result. District No. 3, has no grounds as yet, though ground will be procurred and a fine school house built this summer. Hope to have a better report next year."—*C. H. Harpst, Co. Supt. of Schools, Pagosa Springs*, 1888.

Bent.—"No trees were planted by the schools in Bent County this year. In the towns of Las Animas, La Junta and Rocky Ford, there were about 1,000 shade trees planted, nearly all cottonwoods. A great number of timber claims have been taken in the county, but I know of only four that have planted trees, and which are growing. On those four claims there are probably 10,000 young cottonwood trees."—*John A. Murphy, Co. Supt. of Schools, Las Animas*, 1887.

A PRETTY CITY.

LAMAR, COLO., June 4, 1888.—[Special.]—The 5,000 catalpa trees set out this spring by order of the Council upon the principal residence streets are looking well, and our city, although only two years old on May 24, is prettier than many burghs of greater antiquity.—*Denver Republican.*

"The town of Lamar, in Bent county, has taken the bull by the horns in the way supplying trees. Last spring the town ordered 6,000 young catalpa trees, which were set out along the principal streets. Water was furnished promptly. The trees are thriving nicely. They are in full bloom and look simply beautful. The catalpa is a rapid grower, and will be better liked in this country when it is better known."—*Field and Farm, July*, 1888.

Boulder.—"Estimates of trees planted during the last two years: Soft Maple, 37,000; White Ash, 17,000; Box Elder, 14,000; Cottonwood (part cuttings), 18,000; Walnut, 10,000; Mulberry, 18,000; Catalpa, 4,000; Black Locust, 4,000; Elm, 10,000; Willow, 3,000; Poplar, 1,000; Conifers, 1,000 to 2,000. Also, some timber-culture claims planted. The benefit of forest tree planting is positive, as preserving the moisture and affording protection to fruit-bearing trees."—*C. A. Maxwell, Boulder*, 1888.

"It rained incessantly during Arbor Day, consequently there were no trees planted by the schools. Exercises were had at the school-rooms in the different districts."—*F. A. Shute, Co. Supt. of Schools, Boulder*, 1888.

Clear Creek.—"A few shade trees have been planted in the towns. No forest trees have been planted. I can suggest no plan to promote such action, except the education of the people, and teaching children in the public schools the advantages to be gained and the general economic laws relating to forests."—*Ernest Le Neve Foster, Chairman Board of County Commisssoners, Georgetown*, 1888.

"A much larger number of trees was planted than heretofore. In addition to a considerable number of trees planted by the citizens in the several towns, the pupils in the schools manifested a deep interest by beautifying the school grounds with shade trees. I believe that tree planting would be more extensively practiced in this county but for the want of water and the difficulty of irrigation."—*Henry Bowman, Co. Supt. of Schools, Idaho Springs*, 1888.

Chaffee.—"Arbor Day was observed in parts of the county, but how many, and the kinds of trees planted, I can not tell. A great many cottonwoods were planted in Buena Vista. I planted four elms. Many trees were planted in Salida. I do not know the kinds, except that some planted cottonwood."—*Jacob Kagey, County Supt. of Schools, Buena Vista*, 1888.

Conejos.—"For lack of ditches for watering purposes, and various other reasons, no trees were planted by our schools during the season just passed."—*R. K. Brown, Co. Supt. of Schools*, 1888.

Conejos—"There have been a considerable number of trees planted in the past season by ranchmen; some fruit, but mostly shade trees. They are doing well. I believe that if the State authorities could be empowered to furnish our ranchmen with a certain number of trees every year, it would be not only a great benefit to individuals, but to the people at large, and it would encourage the growing of trees in this county, not only by those receiving the trees, but by others who would be able to purchase their own trees. Something ought to be done to encourage the growing of more trees. You can travel in this valley for miles and see nothing on ranches except crops, etc., no trees. Tree planting is the only thing needed here to make this one of the most beautiful valleys in the western country."—*David Frank, Conejos, 1887.*

"Very few trees were planted in Conejos county this year; it stormed very badly on Arbor Day. Probably two hundred trees were planted, but as to the kind, I regret to say I can give you no information."—*C. H. Brickenstein, Co. Supt. of Schools, Alamosa, 1888.*

Costilla.—"The people of this county, imitating each other, have begun to plant shade and forest trees; especially to ornament and embellish their homes. They plant cottonwood, cedar, ash and pine —hardy growers, and for which the soil is most congenial."—*Charles John, San Luis, 1887.*

"The following named trees were planted in this county this year: Fruit trees, eight hundred; shade trees, two thousand."—*Fred. Etter, Co. Supt. of Schools, Fort Garland, 1888.*

Custer.—"In our portion of the county, representing the Wet Mountain Valley section, which is very high, little has been done towards planting shade or forest trees, excepting in a few instances, mostly in the town of Silver Cliff, and then not very successfully; probably owing to the heavy winds and extreme cold at times; the scarcity of water for irrigating purposes may also have had a bad effect. In the eastern part of our county, facing the plains, in what is known as Hardscrabble park, and more particularly an agricultural region, a great many orchards have been planted, which have done well; and on a great many farms shade trees line the roads and surround the homes of the thrifty farmers of that region."—*A. Thornton, Chairman Board of County Commissioners, Rosita, 1887.*

"The greater part of our county is at so great an altitude that there is not much tree planting done; but fruit and shade trees are being planted more and more every year, trying different kinds, so as to get the varieties best adapted to our climate and altitude. In the eastern part of the county a large number of fruit and shade trees have been planted, say five thousand of the former and one thousand of the latter. Apple, pear, plum, cherry, crab, cottonwood and mulberry are the principal kinds used. They have been planted by individuals, the schools not having grounds prepared."—*Artemas Walters, Co. Supt. of Schools, Westcliffe, 1887.*

"Arbor Day came during one of the most severe snow storms of the season; from two to three feet of snow fell. Quite a number of trees were set out in this county, but I have no way of estimating the number. It is difficult to get them to grow in this altitude."—*J. P. Wright, Co. Supt. of Schools, Silver Cliff, 1888.*

Delta.—"Very few forest or shade trees have been planted in this county, although they are needed very much. The only way I can suggest to encourage the same is to give a rebate on taxes for the planting of trees."—*R. B. Hamilton, Chairman Board of County Commissioners, Delta, 1887.*

"From the best information I have obtained, the number of trees planted this year is: box elder, 320; cottonwood, 130; magnolia, 50;

evergreens, 50. There are few of our school grounds fenced, and it seems useless to urge the planting until the ground is ready. I think we shall do a good work at this next year."—*J. B. McGinty, Co. Supt. of Schools, Hotchkiss, 1888.*

Dolores.—"There were no trees planted in this county. As near as I can learn the county is heavily timbered and quite mountainous, except in the western part, which is almost entirely given to cattle range. There are only three or four ranches in the county."—*J. O. Campbell, Co. Supt. of Schools, Rico, 1887.*

"The agricultural interests in this county may increase, as there is plenty of farming land in the western part that would yield abundantly if there was any demand for ranch produce. Rico, which is the only market in the county, is almost inaccessible from the western portion on account of the absence of good wagon roads. * * * There is no land nearer than twenty-five or thirty miles from Rico, in any direction, where farm produce can be successfully raised, on account of the high altitude. Nothing but a railroad through the western part of the county will give the ranch lands value, and perhaps lead to some tree planting. The county is well supplied with timber and water, more than enough to meet all demands."—*Ibid, 1888.*

Douglas.—"There were about three hundred trees set out in Castle Rock last spring; principally box elders and cottonwood. The trees that there were set out last year are adding a great deal to the beauty of our town."—*Robert N. Hancock, Co. Supt. of Schools, Castle Rock, 1887.*

"I find trace of but very few trees planted in this county on Arbor Day; perhaps one hundred. It rained all of that day. The trees and seedlings planted on timber claims and otherwise this spring, must have numbered at least forty thousand."—*P. H. Hammond, Co. Supt. Schools, Castle Rock, 1888.*

Eagle—"I have not received any reports from school boards as to their having planted any trees the past spring, and I think they have not done so. That schools at Red Cliff and Gilman are so situated that they can not very well plant trees, and the school boards in the ranching portion of our county have not built them houses as was expected, and are using buildings which are furnished them for the time. It is hoped that by another spring there will be something to report from our county."—*L. S. Pierce, Co. Supt. of Schools, Mitchell, 1887.*

"No observance of Arbor Day, within my knowledge, was held in Eagle county. In apology I ought to say that our county is new, and the absolute necessities in the way of vegetables and grain occupy the energies of our people. In coming years I think we shall make a better showing."—*James Ditts, Co. Supt. of Schools, Dotsero, 1888.*

Elbert.—"Trees were planted to a very limited extent in this county last spring. They did well through the summer, but we can not tell how they will stand the winter. Persons planting trees and tree seed, on the high prairies of Colorado, should plow deeply and harrow thoroughly. They should plant seed only in the spring, as the frost is leaving the ground; then give thorough cultivation. Put no other crop on the land, and keep the ground clear of weeds, so it will keep the moisture."—*J. A. Mauldin, Chairman Board of Co. Comrs., Elizabeth, 1887.*

"I have not the figures at hand, but will give an approximate estimate from my knowledge of parties who made purchases, of the number of trees planted in the county this year. On timber culture claims: Cottonwood, 300; seedlings as follows: Russian mulberry, 65,000; hard and soft maple, 50,000; black locust, 10,000; box elder, 40,000; apple, 1,000; ornamental trees, 250. Special tree planting in Districts Nos. 6, 11, 19, 23 and 27. On Arbor Day the weather was very disagreeable, else our districts would have made a good showing."—*B. C. Killin, Co. Supt. of Schools, Kiowa, 1888.*

El Paso—"In consequence of school houses not being fenced, and not being situated so as to irrigate properly, but little tree planting has been done by the schools of El Paso county during the past year. A few trees have been planted in District No. 11, District No. 5, and District No. 8. As a number of districts are fencing lots, we hope to be able to make a better report next year."—*B. A. P. Eaton, Co. Supt. of Schools, Colorado Springs, 1887.*

"It was estimated that from 6,000 to 10,000 forest and shade trees were planted in this county in the spring of 1887, exclusive of nursery stock and planting on timber culture claims. The varieties consist of cottonwood, maple, box elder, ash, elm, locust, mulberry, etc., the first three kinds named above predominating.

"During the present season (1888) a much greater amount of tree planting was done than in the previous year, a moderate estimate placing the total number at 110,000, exclusive of trees and seedlings planted on timber culture claims. A considerable number of native conifer have been planted for ornamental purposes in the towns."

Fremont.—"A great interest has been taken during the last four or five years in the cultivation of shade and ornamental trees, noticeable all over the county as well as in the towns."—*Iman C. McKillip, Ch. Board Co. Com., Florence,* 1887.

"There was no organized tree planting on Arbor Day, though plans were laid by a great many individuals to set out trees and vines. I, for one, had holes dug and set out an acre of grape vines—835 in

number. I presume, from the best information I can gather, it is safe to say that 1,000 apple, 200 pear, 200 cherry, 100 catalpa, 200 box elders and 200 cottonwood trees, and 5,000 grape vines, were set out in this immediate vicinity on that day."—*B. F. Rockafellow, Canon City*, 1887.

"I am sorry to be able to make no showing for Fremont county this year in the matter of tree planting. The intermediate grades of the Cañon City school probably planted a half dozen shade trees, and beyond this I know of nothing done in a public way. The Williamsburg school fished and picked flowers along the river. Their school grounds can not be irrigated, and I may remark that such is the case with most of our grounds. I shall try to have more to report another year."—*Jacob H. Freeman, Co. Supt. of Schools, Canon City*, 1887.

Garfield.—"Arbor Day was not generally observed in this county. Circulars received by me from the Superintendent of Public Instruction were sent to every school district in the county. In some of the districts, especially in the country, where the school property is owned by the district, the parents and children planted trees—mostly cottonwood; the same kind have been planted in Carbondale, Satank, Meeker and Newcastle, and are growing nicely. A few commenced setting out trees and it seemed to be contagious—with farmers as well as others. I suppose at least ten thousand trees have been planted nine-tenths of which are cottonwood."—*Sam M. White, Co. Supt. of Schools, Carbondale*, 1888.

Grand.—"There has been no tree planting in Grand county that has come to my knowledge, even by private individuals."—*John Smart, Dep. Co. Supt. of Schools, Grand Lake*, 1887.

Gilpin.—"Tree planting in Gilpin county is a thing seldom indulged in, owing to the scarcity of water for such purposes. This spring several individuals, having access to what water there is, planted a few trees in front of their residences; possibly twenty-five trees in all have been planted. I believe they are called water willows. Further than this I could not say."—*W. J. Thomas, Co. Supt. of Schools, Central City*, 1887.

"The schools have planted no trees this season. There were about twenty-five planted by individuals at different points in the county. I think they are a species of the willow."—*Ibid*, 1888.

Gunnison.—"I find that in Gunnison City only were trees set out this last spring, and these only to the number of forty or fifty."—*S. D. Carroll, Co. Supt. of Schools, Crested Butte*, 1887.

"Few trees were planted in this county, owing to the fact that in many of our towns the altitude is too great; in some instances sunshine is preferable to shade. It is safe to say that not more than fifty trees have been planted in this county this spring. However, in the lower part of the county I look for a better showing in the future."—*Ibid*, 1888.

Hinsdale.—"So far as informed, no observance of Arbor Day in this county the present year."—*J. J. Abbott, Co. Supt. of Schools, Lake City*, 1887.

"The only observance of Arbor Day I know of in this county was a few trees planted by the school children and myself around our school-house. As we are located up in the mountains, and only a small mining camp, I do not anticipate that Arbor Day will ever be observed extensively, and as a fact we have quite a quantity of trees around us. The kind we planted were cottonwood."—*W. S. Elmendorf, Co. Supt. of Schools, Lake City*, 1888.

"Shade trees have, to some extent, been planted in Lake City."—*John Maurer, Chairman Board of County Commissioners, Lake City*, 1888.

Huerfano.—"I have as yet no report of any kind on trees planted. Our county has but a limited number of school-houses, consequently Arbor Day is not extensively observed. One to two years more will show quite an improvement. Many fruit trees are set out, but not forest trees. There are a number of trees on timber-culture claims set out, but I have no means of ascertaining the particulars."—*F. Pischel, Co. Supt. of Schools, La Veta*, 1887.

"There was but little tree planting on Arbor Day by the schools of this county. We are endeavoring to secure permanent buildings in all of the districts; ornamentation of grounds and setting out trees must naturally follow later; the county, otherwise, has planted a vast number of trees. Under the timber culture act not less than one hundred to one hundred and twenty-five acres have been covered with cottonwood, box elder, maple, and many orchards have been started or enlarged, with principally apple tree—not less than two thousand.

"The value of forests is becoming more and more appreciated, and Arbor day will be a popular one in the near future. Soon our schools will have an opportunity to follow the good example of those in other parts of the State."—*Ibid*, 1888.

Jefferson.—"In reply to your inquiry regarding the observance of Arbor Day and tree planting in Jefferson county, it gives me pleasure to furnish you some points of interest. It has been impossible to get exact data regarding this important matter, but there is enough known

to encourage the friends of this cause in this county. In Golden probably one hundred shade trees (of the varieties of soft maple and cottonwood principally) and fifty fruit trees have been added to the growth this year. In the vicinity of Ralston crossing, six miles northeast of Golden, and also between Golden and Denver, and particularly in the Wheat Ridge neighborhood, large additions have been made in the line of fruit trees. I believe it can be safely estimated that at least five thousand have been planted in this county this year, and they are generally doing well. The varieties embrace many of the standard apple trees, and a few pear, cherry and plum trees."—*Wm. G. Smith, Co. Supt. of Schools, Golden*, 1888.

"Arbor Day was very generally observed, and there were probably one thousand five hundred trees planted, consisting of cottonwood, elm and box elder—about equally divided."—*J. S. Eagleton, Co. Supt. of Schools, Golden*, 1888.

Lake.—"I know of no instance where shade or forest trees have been planted."—*Frank M. Reardon, Leadville*, 1887.

"So far as I am informed, there has been no observance of Arbor Day in this county this year."—*J. J. Abbott, Co. Supt. of Schools, Leadville*, 1887.

La Plata.—"I thoroughly circulated the circulars of the Superintendent of Public Instruction in reference to Arbor Day, and the day was observed with much enthusiasm, especially in the Durango schools; but owing to poor facilities for irrigating, few trees were planted by the school children.

"My estimate of this year's planting (by all parties), in entire county, is as follows: Box elder, 500; cottonwood, 300; aspen, 100; maple, 100; Lombardy poplar, 12; pine (native), 25; spruce (native), 12; walnut, ash, elm, etc., 50 or more. All doing well but the aspen and evergreens.

"Now that it is certain that the two great ditches will be running water into the Montezuma Valley next year, the planting there will doubtless be many thousands. Many timber culture claims have been taken there, and they need trees for wind-breaks, etc. Almost any tree will be likely to flourish there, the altitude being about the same as Denver, and being so far south, the climate is very mild."—*T. J. Jackson, Co. Supt. of Schools, Durango*, 1888.

Larimer.—"The announcement was made that there would be no Arbor Day this year, as the Governor did not think it necessary, and the proclamation to the contrary came so late that it was impossible to issue any circulars, and so I have had no reports of planting either

by schools or individuals, and do not know of any observance of the day in the county, although it is probable it was observed by some." *W. H. McCreery, Co. Supt. of Schools, Fort Collins*, 1887.

"In my immediate vicinity there has been five acres of timber trees planted on section 19, township 8, range 69; and on section 10, twelve acres, but only to re-set vacancies. I put in eight and three-fourths acres of tree seeds on section 2 of the same township. They were black walnut, box elder, sugar maple, black and yellow locust, Weymouth pine, silver fir and red cedar. The ditch company asking $20 per acre for water, I had none. Black walnuts, planted December 1, 1886, came through all right, and are six inches to one foot in height, and in good condition. Giving a rough estimate, I would say one thousand five hundred to two thousand shade and ornamental trees were planted in the county. Not as many as usual, owing perhaps to the hard times. One eighty-acre timber claim was proved up on—the second in the county; owned by J. K. Howard, in section 26, township 8, range 69."—*A. N. Hoag, Fort Collins*, 1887.

Las Animas.—"Trees have been planted in this county to a limited extent only. In older States laws have been enacted relieving people of a portion of road tax in return for planting trees. Such a law in this State, extending its provisions to cities and towns, ought, in my opinion, to be passed, and would be of incalculable value; planting trees along irrigating ditches, and anywhere they would or could be made to grow. I would especially like to see such a law in force in our cities, and I think it would meet with very general approval."—*Delos A. Chappell, Ch. Board of Co. Comrs., Trinidad*, 1887.

"I have received no reports from schools concerning Arbor Day, except from the city schools of Trinidad. They planted eighteen box elders and six cottonwood trees. I presume other schools observed the day, but can get no report from them."—*M. Beshoar, Co. Supt. of Schools, Trinidad*, 1888.

Logan.—"I think no trees were planted by schools in the county. Some were planted on tree claims, and by settlers. Perhaps twenty-five thousand were planted in this way; mostly box elder, maple and ash—also some fruit trees."—*Oscar Trego, Co. Supt. of Schools, Julesburg*, 1887.

"Several of the school districts planted trees around their buildings. It is difficult to give an estimate of the number of trees planted in the county this spring. The most of them have been planted on tree claims. I presume it is safe to say that one hundred claims have been planted, either in seeds or trees, this spring. Five acres in each

would make five hundred acres, with about twenty-seven thousand trees (or their equivalent in seeds) to the acre. The kinds planted are mostly box elder, ash, cottonwood, walnut, honey and yellow locust, catalpa, Russian mulberry and elm, besides a number of fruit trees and shrubs. There is one nursery in the county; that was planted with small fruit and forest trees, several thousand in number. The above estimate is a low one, and the number of trees planted probably exceed the figures given."—*Ibid*, 1888.

Mesa.—"Arbor Day was observed at one place only in Mesa county, and there were perhaps fifty trees planted, nearly all of which were cottonwoods."—*David T. Stone, Co. Supt. of Schools, Grand Junction*, 1888.

Montrose.—"It is not possible for me to give you the desired information about the whole of Montrose county. I can give you a few facts about Paradox valley, which is located in the extreme western end of the county, near the Utah line. This valley is about twenty miles in length by four in width, and is almost entirely destitute of timber. There are a few scattering cottonwoods along the Dolores river, and some box elders along the banks of Spring creek. Along the base of the bluffs which surround the valley are growing piñon, pine and cedar. The settlers are giving considerable attention to the planting of shade and ornamental trees, as well as the setting out of fruit orchards. It is safe to estimate that there are at least one thousand deciduous trees already set out in the valley, of the following varieties: Cottonwood, box elder, Lombardy poplar, mulberry, catalpa, soft maple, sugar maple, mountain ash, horse chestnut, American chestnut, black walnut and butternut. All of these varieties are growing on my own place, and I shall be able in the near future to state with what success."—*Chas. A. Wheeler, Paradox*, 1887.

"I can not give you the exact number of trees planted, but will do so as nearly as possible. The town of Montrose purchased one thousand each of soft maples and box elders, to be planted on the streets. At least one thousand other trees were set out in the yards. About eight thousand fruit trees were planted in the county this spring, and about ten thousand shade trees, including soft maples, box elders, catalpas and willows. Almost every ranch in the county has a few fruit and shade trees, besides the native cottonwood. Many ranchmen are planting seeds and roots of maple, box elder, honey locust, walnut, catalpa, hickory and butternut."—*John J. Tobin, Co. Supt. of Schools, Montrose*, 1888.

Ouray.—"I have not heard that a single tree was planted on Arbor Day in this county. This is almost wholly a mountainous country, and all but a very small area is wooded. The town site of

Ouray had to be cleared of a very heavy, fine forest, although some of the trees were left, and are in a thrifty condition."—*O. E. Ostenson, Co. Supt. of Schools, Ouray*, 1888.

Park.—"I know of but nine trees being planted this season; they are Balm of Gilead. The subject of raising, or setting out shade and ornamental trees receives but little attention in this county."—*I. S. Smith, Co. Supt. of Schools, Fairplay*, 1887.

"This spring more attention has been given to the subject of tree planting. I have encouraged it in the schools, and a number of trees have been planted as a consequence."—*Ibid*, 1888.

"The country would undoubtedly be improved by tree culture. The people, however, will be likely to hang back unless some go ahead and demonstrate the practicability of tree growing at this altitude."—*L. H. Pruden, Co. Com'r, Howbert*, 1888.

Pitkin.—It is reported that the citizens of Aspen have planted many shade and ornamental trees the present season. There was no observance of Arbor Day in the county. The school board of Aspen, the only district in the county having large buildings and school grounds, decided that Arbor Day not being a legal holiday, the schools should be kept open on that day as usual.

Pueblo.—"So far as I know, but very few, if any, trees have been planted outside of the towns."—*Wm. Meredith, Ch. Board Co. Com'rs*, 1887.

"Owing to the want of irrigation, there were no trees planted in the school grounds of the county this year."—*C. T. Taylor, Co. Supt. of Schools, Pueblo*, 1888.

Rio Grande.—"Trees have been planted, for shade and ornamental purposes, in towns and on the better class of farms. There are very few efforts at timber-belts or wind breaks. I suggest, for the encouragement of planting, the passage of a law similar to that in force in some of the States east of us, viz: exemption from taxation, for a term of years, of certain amounts of land upon which specified numbers of trees may be planted."—*Alonzo Hubbard, Ch. Board of Co. Com., Monte Vista.*

Routt.—"Shade and ornamental trees have been planted to some extent. For the promotion of tree planting would recommend certain exemptions from taxation, in proportion to the number of trees planted."—*County Commissioners.*

"Most of my neighbors have set out native trees around their houses. I would suggest that pains be taken by forest officials to as-

certain the result of experiments with imported varieties, and send sprouts and seeds, upon application, free, and that these orders be made through some one in the county appointed by the State Forest Commissioner, the appointee to see that proper use be made of trees so sent. * * * I have growing on my place about four thousand trees, all of which I have planted. I have, besides, a timber-culture claim. Have discovered how to transplant successfully trees from three five years old."—*Thomas H. Iles, Chairman Board of County Commissioners*, 1887.

"No planting has been done, to my knowledge, around school houses in this county, and but little anywhere except on a few timber claims. But little land is at present under ditch, and tree planting will not be done to any extent until more ditches are completed. Those planting to hold timber claims are using cottonwood; but I presume that other and better varieties will be planted when it is safe to do so."—*John T. Whyte, County Superintendent of Schools, Yampa*, 1887.

"There is so little tree planting being done in this county that it is not worth mentioning in your report. Here and there a settler, with a completed ditch and a little more taste than his neighbors sets out a few trees near his house, or along the line of his ditch. There is also an honest effort made by some who have timber claims to comply with the law. Most of our school buildings are located upon ground not under irrigating ditches, and, so, little can be done to interest the children in tree planting. Our settlers, however, should not be judged too severely because of this seeming lack of interest in this matter. They are here undergoing all the hardships of pioneer life, and things that are the most pressing receive attention first."—*Ibid*, 1888.

Saguache.—"Four or five thousand trees have been planted in Saguache county this year (1887)."—*John H. Williams, County Commissioner.*

"But one of the schools of this county observed Arbor Day. The teacher and pupils of this school planted twenty-five trees, mostly native cottonwood."—*C. M. Herren, County Superintendent of Schools, Saguache*, 1888.

"Now that the town is to be beautified by the planting of more than one thousand shade trees along its streets, why is it not just the thing for the church societies to imitate, and beautify their premises? Then, too, the county authorities should see that the land around the court house be properly fixed up and trees set out. Now that the work is begun, let us keep it up under steady headway."—*Saguache Democrat*, 1888.

San Miguel.—"That portion of the county which is settled being entirely mineral, little, if any, attention has been paid to the planting of shade trees. Later, probably, trees will be planted in the lower end of the county, which is naturally agricultural."—*W. A. Taylor, Chairman Board of County Commissioners, Telluride*, 1888.

Summit.—"We have had no tree planting in our county during the year, but a great deal of our native forest destroyed. Could we protect what we have, it would be a great benefit to the State."—*B. A. Arbogast, County Superintendent of Schools, Breckenridge*, 1887.

Washington.—"There has been no planting of trees by school children in our county this spring. As individuals, we observe one continuous 'Arbor Day,' always striving to make our homes and farms beautiful by causing trees to grow thereon. I would estimate that five thousand trees have been planted by ranchmen in our county during the last spring. These are chiefly forest trees: box-elder, cottonwood, maple, black walnut, etc. The town of Yuma set out about eight hundred shade trees along the walks of the residence portions of the town. I have been unable to learn what kinds they were, but think they were mostly maple and box elder. This was a gift made to the town by their Mayor, Charles E. McPherson. In this respect I would point to Yuma and her Mayor as a grand example for the 'towns of the plains' in Colorado—to follow or excel."—*H. H. Brower, County Superintendent of Schools.*

"I am much interested in forestry in the west, and will do all in my power to create a greater interest in regard to it. It is my intention to plant, as soon as possible, an entire quarter section to forest. It is safe to estimate that at least two million forest trees will be planted in Washington county alone the coming spring. The greater portion of that number will be planted in fulfillment of the timber-culture law, while not a few will be planted for parks, or groves for protection and shelter."—*Wm. E. Wolfe, Wray*, 1887.

"It is difficult to make any estimate of the number of trees planted on Arbor Day. I would say that nearly all, if not all, of the schools which were in session, observed the day in some way. When the school was being held in a permanent school-house, trees were set out. I should say that probably six schools set out trees, planting in all say five hundred; the kinds were ash, box elder, maple, cottonwood and catalpa for the most part. I think no less than five thousand trees were planted in this county during the spring around houses and on timber claims."—*W. Curtiss, Co. Supt. of Schools, Akron*, 1888

Weld.—"Shade trees have been pretty extensively planted in this county, especially within the limits of Union Colony."—*County Commissioners*, 1887.

Owing to the misunderstanding with respect to the issuing of an Arbor Day proclamation, no preparation was made for the observance of the day by the schools. Mr. J. B. Cooke, the County Superintendent of Schools, writes, under date of June 27, 1887: "It was a great disappointment to us all. Many of our schools planted trees, but I have no record of it. Next year please have the day appointed at least a month ahead. In Weld county we are *unanimously in favor of the day.*"

"I estimate that half a million shade and timber trees were planted this spring within the *present* limits of Weld county. These were mostly on timber claims, and consisted of probably one-half white ash, with box elder, soft maple, elm, cottonwood, wild black cherry and catalpa speciosa, in the order named."—*A. E. Gipson, Greeley,* 1887.

"Greeley people are cutting out more trees than they are planting. Still a good many elm, maple, plane and ash trees are being planted. Nothing was done on Arbor Day, except in case of the Highland Lake district, which observed the day with exercises, a picnic, and planting a few trees, chiefly to take the place of some that had died. Some other districts planted trees, but I received no definite information of same in such form that I can make report. Another year think I will send circulars to each district, with a blank to be filled and returned to me."—*A. K. Packard, Co. Supt. of Schools, Greeley,* 1888.

PLANTING UNDER THE TIMBER CULTURE ACT.—It has been impossible to collect as yet, satisfactory, or reasonably complete, information, as to the amount of tree planting that has been done in the State under the timber culture act. It is easy to learn, from the records of the United States district land offices, that many thousand of timber culture claims have been filed, and that several million acres of public land, in Colorado alone, have thus been appropriated; but no ordinary research could determine the facts with respect to the tree planting done in that connection.

Although the law has been in force nearly fifteen years, and final certificates are granted (upon due proofs, etc.), at the expiration of eight years from date of the respective filings, it appears that only a very few claims of this character have ever been perfected, and that

under cover of the law most glaring frauds have been perpetrated. That the law has largely failed in its object, and been a source of great loss to the government, or people at large, is the conclusion which most thoughtful persons have reached. At each annual session of Congress, for several years past, strenuous efforts have been made to effect the repeal of the timber culture, pre-emption, and desert land acts, and replace them with some enactment which would benefit the people more, and afford less opportunities for fraud. These laudable efforts have hitherto failed, but the friends of reform are still active, and a successful result may yet be attained.

In this State, and elsewhere, *bona fide* timber culture claimants who have honestly sought to improve their claims, as required by law, should be encouraged in every possible way—to the extent, perhaps, of giving them, when necessary, additional time in which to perfect or complete their planting, etc. The present season (1888) has been so unusually dry, even for this region, that many timber culture claimants have failed in their attempts to grow crops or trees.

TREES FOR HIGH ALTITUDES.—Having received a number of inquiries as to the kinds of shade and ornamental trees best adapted for planting in the mountain towns and other elevated situations, I addressed letters to Messrs. A. E. Gipson and D. S. Grimes, well known arboriculturists, asking their views upon the subject. The following replies were received from them:

Replying to your inquiry, I must say that I can throw little light on the matter of "trees for high altitudes." Could not recommend one of our valley trees, or the well-known shade trees of the plains. Have little hesitancy in saying that they would prove unsatisfactory at an altitude of nine thousand feet and upward. The mountain poplar or "quaking asp" would do, but of course is not a tree of much value. The native narrow-leaf cottonwood would probably succeed fairly well, and likewise the Balm of Gilead. The native mountain ash and

wild cherry would, I think, stand an altitude of ten thousand feet, but would not attain any considerable size. Of course our pine trees could be grown. Several species of native maple and alder could be safely planted for lawn or ornamental trees; likewise our beautiful spruces and cedars. Several varieties of crabs would stand an altitude of eight to nine thousand feet.—*A. E. Gipson, Greeley.*

A few years ago I sent some maple and elm trees to Leadville. What attention they received, or success they attained, I never learned. Have sent the same varieties to Buena Vista, and they are doing well. The elm and maple are indigenous to the extreme northern borders of the United States, and to Manitoba and New Brunswick. I believe, however, that altitude affects some varieties of trees more than latitude. This is a question I would like to see demonstrated by actual experiment. Both the broad and narrow leaved cottonwood, and box elder, do well in high altitudes. There is a mountain balm, which in leaf and general growth resembles the narrow leaf cottonwood. It can not easily be distinguished from that tree—only by the aroma or fragrance of bud and leaf. Then there is our alder—superior to the English alder, found growing along the streams, from the foot-hills to almost timber line. Although not a tree of much size, its smooth, glossy bark and rich green leaves make it very attractive. Then, again, there is a wild cherry I have seen growing up on the Poudre, above Livermore, worthy of cultivation. The aspen, although found in quantities growing at high elevations, is of no value as an ornamental tree. Doubtless the white ash would do well in the mountains.

It seems to me that if persons could be found who would properly plant and take care of trees, the State might do a good experimental work, for future reference, by furnishing free to such persons, in certain localities, trees for such an experimental test. But then you know, my dear friend, the State does not deal in "futures." The legislative atmosphere is not so clear as to see so far ahead. I am, however, glad to see your devotion to the important subject, and hope you may succeed in drawing the attention of the general public to view the subject of forestry in its true light.—*D. S. Grimes, Denver.*

SUGGESTED FORESTRY LEGISLATION.

STATE.—The following measures have been suggested as proper ones to bring to the attention of the next General Assembly. Some of them, at least, would seem to be of immediate importance:

1. That a memorial to Congress be adopted, urgently setting forth the immense and increasing destruction of the public forests, in Colorado and adjacent Territories, by fire, railway companies, charcoal burners, lumbermen and others, causing great and irreparable injury, and earnestly requesting the enactment of laws to afford necessary relief.

2. That a liberal annual appropriation be made to the State Horticultural and Forestry Association to aid it in its work.

3. That Arbor Day be established by legislative act, and made a holiday in the public schools.

4. That more substantial encouragement in the way of premiums, etc., be given for the planting of trees. The bounties and exemptions, now provided by law, are inadequate.

5. That railway and telegraph companies, mill-owners, charcoal manufacturers, and others, who consume, in the prosecution of their business, large amounts of timber or other forest material, be required to make reports, in connection with the use and consumption of such timber or material, to the State Forest Commissioner, as may be called for by that officer.

6. That the act found at page 161, of the laws of the Fifth General Assembly, be so amended as to require the continued *maintenance* of fire notices; such notices to be posted annually, when necessary.

7. That a law be enacted prohibiting the wasteful use and destruction of young evergreen trees during the winter holidays, or at other seasons.

NOTE.—Since the issue of the first edition of this report, acts have been passsd by the General Assembly for the establishment of an annual Arbor Day, and making appropriatlons for the use of the Colorado State Horticultural and Forestry Association. A legislative memorial to Congress, relative to the destruction of native forests, has also been adopted.

8. That suitable rewards be provided for those persons who may give information leading to the arrest or prosecution of parties violating the forestry laws.

NATIONAL.—The following paragraphs are taken from annual reports of Commissioners of the General Land Office, for the years 1885–6–7:

The government is now expending large sums of money in attempts to substitute by artificial means the regulation of the flow of the Mississippi river, which nature had provided in the dense woods originally surrounding the sources of its numerous tributaries.

That wise and speedy measures should be adopted for the preservation of forests on the public domain is, in my opinion, an incontrovertible proposition. To this end I recommend the immediate withdrawal from appropriation, sale, or disposal of all the public forests and lands valuable chiefly for timber, subject to future legislation, for the permanent reservation of designated areas and a more economically governed disposal of such timber lands or timber as it may not be necessary indefinitely to reserve.

The cutting of timber from public land, for sale and speculation, has been permitted to continue for such a length of time without notice, or with but feeble interference by the government, that in some sections of country the mill men and speculators have come to regard the public timber as theirs by tacit right, and seem to consider any attempt of the government to now restrict their cutting and disposing of the same to the express terms of the law as an unwarranted interference. So prevalent is this feeling that the most flagrant and persistent violators of law adduce in their defense the practice in their localities for years under the authority and permission secured from a former lax administration of the law.

As stated in my annual report for the fiscal year ending June 30, 1885, and in my letter to the Department dated April 20, 1886, in reply to Senate resolution of March 17, 1886, asking what, if any, additional legislation is necessary to protect the timber on the public domain, I have the honor to submit that the repeal of the pre-emption laws and the commutation feature of the homestead laws, under which thousands of entries are annually initiated for the sole purpose of securing the timber thereon, also the repeal of the act of June 3, 1878, chapters 150 and 151, and the first and second sections of the act of June 15, 1880, entitled "An act relating to the public lands of the United States," are necessary to that end; and, further, all existing laws relating to timber cutting on the public domain should be

revised and supplemented by such legislation as shall grant reasonable privileges to *bona fide* settlers, and prevent monopoly and unnecessary waste and destruction of the public timber.

The area of timbered lands in the United States is disappearing at a ratio that excites grave apprehension, while timbered agricultural lands in the public States and Territories generally may be regarded as practically exhausted. The necessity of clearing land of its timber, preliminary to making a farm, is exceptional. It is want of timber, and not its surplusage, that afflicts settlers on the public domain. The struggle to accumulate great private fortunes from the forests of the country has reduced forest areas to a minimum. What is left at the heads of rivers and streams and on mountain sides should be preserved as of infinite importance and value—for climatic effect, the natural regulation of the flow of waters, and to prevent the relapse of large agricultural districts to a desert condition.

The recommendations heretofore made by this office, and which have been strongly urged by the Forest Commissioners of California, Colorado and other States, are that all exclusively timber lands of the United States be segregated from the area of disposable lands and reserved from general entry. This is unquestionably the first step to be taken if the forest lands are to be protected by the government. Permanent forest reservations should then be established where necessary, and suitable measures adopted in respect to the disposal of the remainder.

It has been the opinion of many of our people that the control of the public timber lands within the State should be transferred to the State. Our State forest laws are, to a degree, inoperative, for the reason that the federal government, and not the State, has the direction and control of the public woodlands. In furtherance of a movement to give the State control of such lands, Congress has been memorialized, and the subject more or less agitated by State organizations and individuals interested in the question. The later, and, perhaps, the better opinion is, that owing to the great difficulty of obtaining legislation of that character in behalf of any particular State, or States, some general measure should be proposed applicable to the entire body of public timber lands, wherever situated, and which would leave them under the control of the General government. There-

fore, a bill in accordance with the last named plan was prepared, and copies of the same sent to leading citizens in different sections of the country for an expression of their opinion upon its merits. The proposed measure met with general favor, and was also heartily endorsed by the American Forestry Congress, at its 1887 annual meeting.

The bill provided for the withdrawal from sale, or entry, of the public forest lands, and their classification. It instituted in the Department of the Interior, the offices of Commissioner of Forests, and four assistant commissioners; authorized the appointment of necessary forest inspectors and rangers, and sought to establish an effective and reasonably complete forest administration. By a system of licenses for the cutting of public timber, it provided for the needs of settlers and others. Five hundred thousand dollars was named as the amount required to carry out the provisions of the act.

The bill was duly introduced in both branches of the 1887–8 Congress, but seems to have made but little, if any, progress beyond the committees to which it was referred. A new bill, differing in some important particulars from the old one, will be prepared and introduced at the next session of Congress.